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ABSTRACT

This report documents the development of a long-range plan for instructional telecommunications in the Kansas Regents system. It was assumed from the outset that the plan would include provision for educational programs in the communities outside the state universities and would, in fact, extend to include a statewide computer network. The background study for the plan began by identifying existing resources such as satellite delivery systems, data and video systems, and the Systems Network Architecture (SNA) data network. A second data network, Kansas Regents Network (KARENET), is being developed to provide access to electronic mail systems, library catalog systems, and databases. The study also obtained data, briefly noted in this report, on the distance learning campus objectives of the University of Kansas, Kansas State University, Fort Hays State University, Pittsburg State University, Emporia State University, Wichita State University, and the Kansas College of Technology. Recommendations are discussed in terms of system goals, and a summary of responses to the proposed plan is provided. Appendixes, which make up the greater part of the report, provide an explanation of the transmission of television pictures and sound; a distance education glossary; a list of existing and planned campus resources including organizations, programming, staff, and equipment; an outline of videotape formats and broadcast systems; and a list of members of the technical issues subcommittee responsible for the plan. (DB)

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LONG RANGE TECHNICAL PLAN

FOR

INSTRUCTIONAL TELECOMMUNICATIONS

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KANSAS BOARD OF REGENTS

LONG RANGE TECHNICAL PLAN

FOR

INSTRUCTIONAL TELECOMMUNICATIONS

Prepared by

The Technical Issues Subcommittee

of the

Distance Learning Committee

Kansas Board of Regents

June 1989

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CHARGE

On October 13, 1988, Dr. Joyce Scott, Chairperson of the Distance Learning Committee, appointed a Technical Issues Subcommittee consisting of representatives from each Regents institution. The committee was given the following charge.

1. Develop a comprehensive long-range plan for instructional telecommunications in the Regents system from the technical perspective being sure to consider the diverse technologies available and their maximum beneficial integration.

2. In relation to existing, planned and proposed telecommunications systems serving Regents institutions, develop:

   a. Criteria for appropriate technical standards to be in force by type of technology;

   b. Minimum standards for equipment compatibility that can be used to guide equipment acquisition at all Regents institutions.

3. Consult throughout the planning process with other state agencies (State Department of Education and the Division of Information Systems and Communications (DISC) among others) to assure adequate information for systems compatibility.

The letter of charge is included in this report as Appendix A.

ASSUMPTIONS

The study began without the benefit of stated Regents or campus goals and objectives for distance learning or for the integration of technology to support the exchange of information in the academic and administrative environments. As a result, the committee established the following assumptions.

1. There is an opportunity for Regents institutions to reach beyond traditional campus boundaries to deliver and receive instructional materials.

2. There is an opportunity for Regents institutions to share and jointly participate in academic research and instruction.

3. There is an opportunity for Regents institutions to use distance learning technologies to support a wide variety of other applications such as marketing, administration, public service activities, health care referral and consultation and on-campus instruction.

4. Aggregating campus requirements at the Regents system level through short and long range planning suggests the need for a statewide network that supports Regents' and state agencies' information distribution requirements.

The committee also assumed that readers of this report might not be familiar with some of the technologies discussed in it; therefore, an explanation of the principles employed in the transmission of television pictures and sound is included as Appendix B and a glossary of distance education terms is included as Appendix C.

METHODS AND FINDINGS

Existing Resources

REGENTS

To address its charge, the committee identified existing Regents resources that support the various technologies available on each campus. These resources, summarized in Appendix D, include equipment, technical protocols, staff, facilities and plans. Major existing vehicles for transmission of instructional materials from Regents institutions to off-campus locations include the satellite-uplink at KSU, TELENET at KSU, Channel 13 at WSU, and Channel 8 and TELENET at ESU.

At the broadest level, what emerged from this assessment of existing resources was the fact that these technologies developed separately on the campuses and to a great degree continue to do so.

What also emerged was the fact that until recently, networking among campuses and other state agencies was primarily for voice communications; data and video applications were primarily university or local-area based. These facts emphasize the need to develop a strategic plan to ensure that the short- and long-term use of technology supports the goals and objectives of the Regents institutions and the Regents system as a whole.

STATE

Discussions with DISC and information obtained from a variety of other sources reveal a number of existing, emerging or planned communications resources of the State of Kansas which could be important in the delivery of instructional materials.

The State of Kansas supports two primary data networks, the SNA network and KARENET. The SNA (Systems Network Architecture) network provides access to computers in Topeka which run administrative applications and an electronic mail system called "PROFS." To enable Regents institutions to interconnect with one another and to access the SNA network, a Kansas Regents Network called KARENET is being developed using AT&T's ISN (Information System Network) packet switches linked with high speed (56 KB) circuits. It is expected that KARENET will be completed in 1989.

KARENET has the potential to provide access to the following existing applications:

* BITNET, MIDnet, and PROFS, which are electronic mail systems that provide access to other electronic mail systems such as NSFnet and airline schedule systems;

* Regents library catalog systems;

* applications in the Department of Administration;

* commercial databases, such as WESTLAW, on a fee for service basis;

* state government databases.

When KARENET is completed, Regents institutions will have a backbone data communications network in place; its usefulness to the institutions will depend on their development of applications which can be shared.

DISC is also reconfiguring KANS-A-N to provide dynamic bandwidth allocation which will enable Regents institutions and other state agencies to transmit compressed video signals if compatible codecs are in place at each end.

Common Goals

Common goals that one or more institutions hope to accomplish through the use of distance learning technologies are to:

1. Deliver instruction to off-campus locations.

2. Receive instruction from outside sources to enhance local course offerings.

3. Improve communication for administrative purposes, such as teleconferencing.

4. Improve data and information transfer in support of research and scholarship.

5. Enhance public service, such as the dissemination of information to businesses.

6. Extend the influence of cultural events occurring on campus.

Of these six general goals, the first was given primary emphasis on most campuses. The other five tended to be mentioned as goals but not discussed in any detail.

Campus Objectives

Members of the subcommittee were able to ascertain the following campus objectives for using distance learning technologies.

UNIVERSITY OF KANSAS

* Provide video courses in the metropolitan Kansas City area by Fall 1989.

* Transmit full-motion video:

  among KUMC, the Regents Center and Lawrence, and

  from KUMC, the Regents Center and Lawrence to the satellite uplink at KSU.

* Provide two-way audio/video transmission between KU and KSU to support joint programs in Computer Science and Engineering (Lawrence and Manhattan) and cancer research (Kansas City and Manhattan) and to provide programming for the Star Schools project.

* Extend the educational resources and technical expertise of KUMC to communities across the state;

* Strengthen affiliations with VA and other hospitals and agencies to enhance education, research and patient care programs of the University and those institutions;

* Export KUMC's management expertise to smaller hospitals;

* Provide support in various forms --- outreach, continuing education, physician consultation, etc. --- to hospitals and health professionals throughout the state.

KANSAS STATE UNIVERSITY

* Disseminate cooperative extension, outreach and continuing education programs statewide.

* Provide programs to grades K-12 as part of the Star Schools project.

* Transmit full-motion video to any community college, public school, public broadcast facility, state agency and county agent's office in Kansas.

FORT HAYS STATE UNIVERSITY

* Provide outreach and continuing education programs to the forty-four counties of western Kansas.

PITTSBURG STATE UNIVERSITY

* Deliver instruction to six local community colleges, the Kansas City area, local and statewide business, school districts, and vocational technical educators.

EMPORIA STATE UNIVERSITY

* Provide comprehensive and interactive delivery of:

  the graduate programs in the School of Library and Information Management (SLIM), which are unique in Kansas, throughout the Midwest and to the various constituencies, such as libraries, served by SLIM.

  Teachers College programs in the Kansas City area;

  other programs at the university in areas where it is authorized to serve.

WICHITA STATE UNIVERSITY

* Deliver telecourses in its thirteen-county area using cable television and a new ITFS system.

KANSAS COLLEGE OF TECHNOLOGY

KCT, although invited, did not participate on this committee.

RECOMMENDED SYSTEM GOALS

Analysis of common goals and campus objectives indicates interest in using distance learning technologies to deliver courses and programs to sites throughout the state, including hospitals, county agricultural extension offices, community colleges, public schools, public broadcasting stations and businesses. Also mentioned is the need to deliver courses and program materials to the Regents Educational Communications Center for broadcast. Based on this information and following an examination of instructional telecommunications plans and initiatives in other states as well as plans and activities in the Division of Information Systems and Communications in support of voice, data and video transmission, the committee recommends the following strategic goals for distance learning in the Regents system.

1. Establish a point-to-point broadband communications network.

Current stated objectives of Regents institutions already demonstrate a clear need for a statewide broadband communications network which would be capable of transmitting full-motion video as well as voice and data. Such a network would not need to be built by the Regents; communications vendors already have broadband networks in Kansas and are likely to develop new connections and services as needs expand. The problem for Regents institutions is how to promote establishment of pricing mechanisms that make existing and future broadband network services affordable.

Interconnection of the seven Regents institutions via a point-to-point broadband communications network would enable the institutions to:

1. originate broadcast quality programming, as well as a wide variety of voice and data transmissions, from any institution within the system;

2. share courseware among the campuses as a means to enhance existing courses and programs or to provide courses and programs that would not otherwise be available;

3. deliver joint and cooperative programs more effectively;

4. connect existing broadband communications facilities in the state;

5. connect each Regents institution with the satellite uplink facility at KSU.

Interconnection of Regents institutions with a statewide point-to-point broadband communications network would expand the opportunities of Regents institutions even further, enabling them to:

1. deliver courses to business, industry, community colleges, vocational technical schools, and primary and secondary schools;

2. provide health care consultation throughout the state; and

3. participate in joint projects with business, industry, and government.

Development of a point-to-point broadband communications network is compatible with the strategic direction of other state agencies. The Department of Education wants to link clusters of rural school districts with fiber and wants to connect community colleges with vocational technical schools. Kansas Technology Enterprise Corporation (K-TECH) sees development of a broadband communications network linking government, educational institutions and business as vital to economic development in Kansas. DISC sees fiber optic cable as the communications medium of the future because of its capability to carry the increasing volume of voice, data and video communications of state government.

2. Establish a statewide point to mass broadband communications network by interconnecting satellite, open circuit broadcast, ITFS and CATV.

Given the embedded investment in satellite, open circuit broadcast, ITFS, and CATV in Kansas, interconnection of these facilities with Regents institutions and with point-to-point broadband networks would maximize the utility of these resources for distance learning purposes. For example, cable systems in the state could receive and redistribute programs originating at the satellite uplink facility at KSU. Similarly, low-power television systems or ITFS systems could be used to deliver courseware to the place-bound learner at home or at the job site. Linking point-to-point and point-to-mass systems in Kansas would provide the widest possible distribution of instructional materials.

3. Increase cooperative planning with other state agencies and the private sector.

The citizens of Kansas cannot afford to support a variety of incompatible or unnecessarily redundant systems. Cooperative planning which pools the needs, requirements and resources of potential users of the system will be necessary. Ways to increase cooperative planning include the following:

1. Ask TISC to participate with the Computer Advisory Committee in developing coordinated Regents input to DISC regarding Regents technical needs in voice, data and video services to support distance learning.

2. Participate in planning discussions with other state agencies and the private sector to maximize system benefits.

4. Establish the mechanisms to extend Regents educational resources to the citizens of Kansas.

ESTABLISH A DISTANCE LEARNING TECHNICAL SUBCOMMITTEE (DLTS) TO PLAN, DEVELOP AND IMPLEMENT THE DELIVERY VEHICLES FOR DISTANCE LEARNING AT THE REGENTS SYSTEM LEVEL.

This committee would replace the Technical Issues Subcommittee. Each institution would choose an individual who can represent the institution in discussions of technical issues related to distance learning. The committee's charge would be to:

plan, develop and implement integrated distance learning technical systems through a process which includes Regents institutions, other state agencies, and the private sector as appropriate and necessary to maximize the resources and benefits of all participants;

develop and periodically update video standards and protocols for recommendation to DISC;

annually review, update, and recommend distance learning technical goals and objectives for the Regents system;

exchange information about campus technical plans, activities, and resources which support distance learning;

monitor and exchange information about opportunities and technologies which could be used to support distance learning;

advise the Distance Learning Committee on technical issues as requested;

exchange information with the CAC by having the DLTS staff attend CAC meetings on a regular basis.

COORDINATE DISTANCE LEARNING TECHNICAL SUBCOMMITTEE ACTIVITIES WITH COMPUTER ADVISORY COMMITTEE ACTIVITIES.

Distance Learning Technical Subcommittee members have responsibilities related to video technologies on their respective campuses while members of the CAC are responsible for computing and in some cases telecommunications. Although both committees will share an interest in transmission, the DLTS will focus primarily on educational uses of various technologies including video production and planning while the CAC will focus more on transmissions and systems maintenance. To facilitate coordination between the two committees, Board staff to the DLTS could attend CAC meetings.

As the management of voice, data and video technologies becomes more integrated on the campuses, both the CAC and DLTS could be dissolved and a person responsible for information resource management at the institution could serve on a new Regents level Information Technology Committee (ITC). Institutions not achieving the integration of voice, data and video technologies might send representatives from each area to the committee meetings, but each institution would have only one vote regardless of the number of people in attendance. The ITC would be charged to insure that, to the greatest possible extent, the technical capability exists to carry out the goals and objectives of the Regents system. The committee would react to question or issues referred to it by COCAO but would be free to make unsolicited recommendations to COCAO if it deemed it appropriate. Non-voting participants might include representatives from other state agencies and the private sector. The agenda for each semester might be discussed by the full committee and non-voting participants, with subcommittees assigned to complete specific agenda items before the next general session.

DEVELOP PILOT PROJECTS.

At current tariffed rates, use of existing broadband fiber optic cable systems in Kansas is prohibitively expensive for Regents institutions. Options available to the Regents under these circumstances include seeking increased state and federal funding for distance learning, seeking approval and funds to build a state broadband communications system that would serve Regents needs, and seeking ways to change the

current tariffed rate structure. The Technical Issues Subcommittee recommends the last option as a first step.

One means to circumvent or change current tariffed rates for broadband communications is to interest communications vendors in cooperative pilot projects under the auspices of Kansas Technology Enterprise Corporation (K-TECH), a state agency with responsibility for economic development through technical initiatives. These projects would be designed to bring the resources of the campuses, such as faculty expertise and research facilities, together with the resources of the vendors, such as transmission facilities and equipment. Presented as economic development initiatives, it may be possible to avoid current rate structures, at least for the duration of the project. This initiative is already being explored by several campuses, the Regents office, and K-Tech.

SUMMARY OF RESPONSES TO THE CHARGE

1. The first phase in the development of a long-range plan --- the statement of recommended Regents system technical goals --- is completed. To develop technical objectives, campuses and the Distance Learning Committee need to articulate more specific distance learning requirements. These requirements can be reviewed by the Distance Learning Technical Committee, which would work toward development of integrated, compatible support systems for distance learning applications.

2. Establishing and enforcing standards and protocols for State information and telecommunications systems is a DISC responsibility; however, the Regents can provide input to DISC and guide acquisitions on the campuses as a way to integrate systems, planning and development. Prior to acquiring hardware, firmware, or software, the purchaser needs to consult with the appropriate information technology department on the campus. If this consultation occurs, intra- and inter-campus compatibility can be reviewed and maximized.

As long as major industry standards, such as NTSC, are followed, compatibility is not a major issue in most applications. However, in compressed video, because no industry standards currently exist, the standards are proprietary and one manufacturer's codec will not communicate with another's; therefore, compatibility is a major issue for this technology at this time and prior consultation with DISC and other Regents institutions is important to ensure compatibility.

Appendix E includes a table of video tape formats used at the Regents institutions which institutions can reference when preparing tapes for one another, and it provides information about existing and proposed worldwide broadcasting systems.

3. The TISC has consulted regularly with DISC throughout the planning process. If a DLTS is constituted, communication with the CAC, DISC and with other agencies on distance learning technical matters will continue.

APPENDIX A:

LETTER OF CHARGE

The
Wichita
State University
Office of the Executive Vice President for Academic Affairs

October 13, 1988

William S. Mahler, KUMC
Mike Leikam, Fort Hays State University
Roland D. Cummings, Pittsburg State University
Breck Marion, Kansas University
Jay Brickman, Emporia State University
Robert Kelly, Kansas College of Technology
Mel Chastain, Kansas State University
Fred Hurst, Wichita State University

Dear Colleagues:

The Distance Learning Committee of the Kansas Regents system is charged with recommending to the Council of Chief Academic Officers suitable policies, procedures, and operational models related to distance learning. Of particular emphasis in its deliberations is the role of electronic media in provision of credit and noncredit off-campus instruction.

A first step in electronically mediated distance learning was achieved several years ago with the implementation of Telenet. Another is foreseen in the establishment of a Regents Education Communications Center. To date, however, no long-range plan for a Regents' instructional telecommuunications system has been developed from a technical point of view. Therefore, the Distance Learning Committee has envisioned the formation of a Technical Issues Subcommittee to aid in this endeavor. With the concurrence of your DLC institution representative and chief academic officer, I am pleased to ask you to serve on this subcommittee.

The Technical Issues Subcommittee is asked to work within a long-range planning context to achieve the following:

1. Develop a comprehensive long-range plan for instructional telecommunications in the Regents system from the technical perspective being sure to consider the diverse technologies available and their maximum beneficial integration;

2. In relation to existing, planned and proposed telecommunications system serving Regents institutions, develop:

   a. Criteria for appropriate technical standards to be in force by type of technology.

   b. Minimum standards for equipment compatibility that can be used to guide equipment acquisition at all Regents' institutions.

3. Consult throughout the planning process, with other state agencies (State Department of Education and DISC among others) to assure adequate information for systems compatibility.

Morrison Hall, The Wichita State University, Wichita, Kansas 67208-1595 • (316) 689-3010

I am asking Mr. Mahler to chair the committee and call the first meeting. If, for any reason, you will be unable to serve, please advise me.

Sincerely,

Joyce A. Scott

Joyce A. Scott
Executive Vice President for Academic Affairs

cc: Distance Learning Committee
COCAO
Martine Hammond
Barbara Paschke

APPENDIX B:

TRANSMISSION OF TELEVISION PICTURES AND SOUND

Electromagnetic Waves

The principles employed in the transmission of television picture and sound are extensions of several important discoveries made more than 100 years ago involving the related phenomena of electricity and magnetism. In 1856 James Clerk Maxwell further developed Faraday's concept of magnetic lines of force and expressed the theory that electrical energy existed within the universe in the form of oscillating waves. He further suggested that not only did these electric waves travel at the same speed as light but also that the waves were physically related to light itself.

By 1887 Heinrich Hertz was able to prove the existence of waves of electrical force by developing the equipment with which to generate them. His experiments revealed that the waves had varying lengths and differing rates of oscillation. It was further seen that these two factors interact with each other in a mathematical relationship also involving the wave velocity.

Before proceeding, it should be pointed out that while the vibrations that constitute natural sound in some ways resemble the qualities of the waves of the **electromagnetic spectrum**, present-day scientific thinking considers each of these to be a separate phenomenon, existing side by side within the physical laws of the universe. Pressure sound waves can be transmitted only through the media of the atoms and molecules of solids, liquids, and gases; whereas electromagnetic waves can move also through the vacuum of space.

The analogy to water waves has developed as a convenient way of expressing the very complex properties of both of these forms of energy transmission. While sound pressure waves are relatively well understood, most scientists confess an inability to comprehend totally the nature of electromagnetic energy.

In any case, let us use the water wave analogy as a means of understanding the properties of both types of oscillations. Think of a series of ocean waves as seen from a cutaway side view. In the water there is a rubber ball that floats up and down with the crests and troughs of the passing waves but remains stationary in relation to a fixed point on the sand beneath. Riding just in front of a wave crest is a body surfer. If the person moves in a straight line, he or she will indicate the speed at which the wave is traveling relative to the shoreline. In our hypothetical ocean, all of the waves come into the shore at the same speed. With this in mind, we can tell several important things by looking at the ball and the surfer. (See fig. A.1.)

Figure A.1
Relationship of wavelength, frequency, amplitude, and velocity.

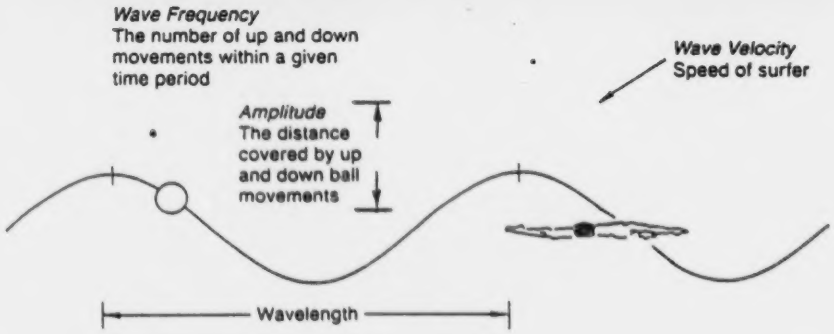
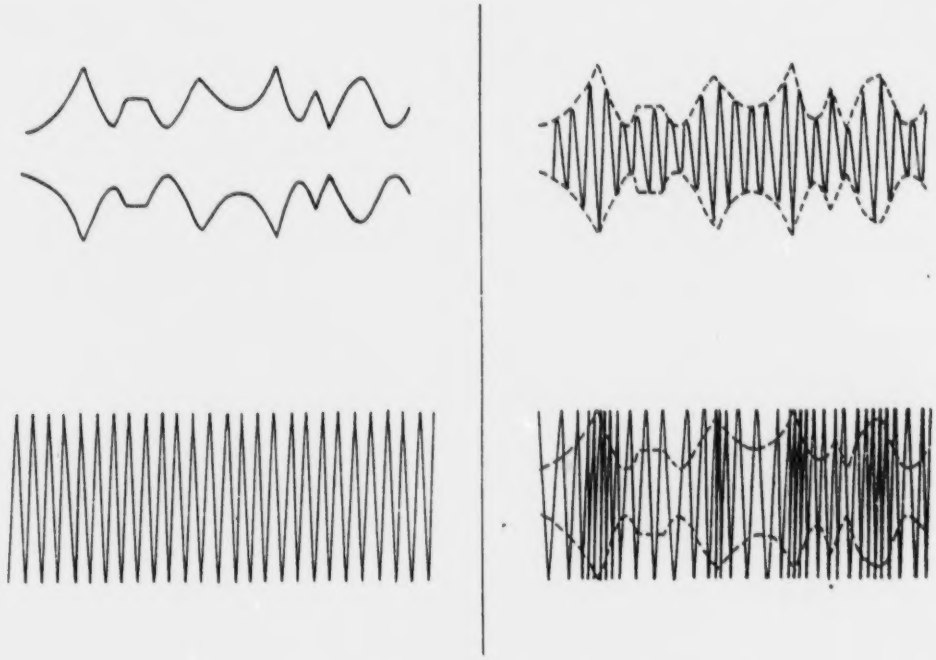

Wave Frequency
The number of up and down movements within a given time period
Wave Velocity
Speed of surfer
Amplitude
The distance covered by up and down ball movements
Wavelength

Figure A.2
AM and FM modulation of a carrier wave



TOP: The electronic signal coming from the microphone or recorder consists of electrical information that carries the original sound waves.
BOTTOM: The unmodulated carrier wave is generated at a specific frequency in the electromagnetic spectrum.

TOP: **AM Broadcasting.** The electronic signal can be superimposed onto the carrier wave by changing or modulating the amplitude of the carrier wave. The dotted line indicates the original electronic signal
BOTTOM: **FM Broadcasting.** The electronic information also can be combined with the electromagnetic wave by varying or modulating the frequency of the carrier wave. Where the original electronic signal is strongest (indicated by the pattern of the dotted lines), the frequencies are relatively compressed.

First, we can measure the distance from crest to crest to determine the **wavelength**. We then notice that this wavelength has a definite relationship to the number of times the ball goes up and down in a certain period of time. This crest-to-trough and back-to-crest rate of oscillation is the measure of **frequency**. If the wavelength were shorter (distance between crests), the ball would go up and down more often in the same period of time. (Do not forget that our waves move through the water at a constant velocity.) This is an important quality of waves of electrical energy---the greater the frequency, the shorter the wavelength.

Watching the up-and-down movements of the ball over a long period of time may give us one more important piece of information. The ball may continue its same up-and-down movement at a consistent number of oscillations per minute, but as the hours pass we may notice that it is not going as far up and down. As in a real ocean, the height of the wave is often the result of energy expended by a storm out at sea. The height of the wave will decrease as the energy creating it decreases. In electrical energy wave theory, the amplitude or amount of oscillation is the result of the amount of energy applied to the wave.

The velocity of the wave is simply a measure of how long it takes the crest of a single wave to move from one given point to another. In the case of electromagnetic energy, this speed is constant--the same as the speed of light, roughly 186,000 miles per second. As with light, the direction follows that of a straight line. The complex exceptions to this general rule are such that they need not draw our attention.

The basic wave cycle that measures one complete oscillation from crest to trough and back to crest again is usually called a hertz in honor of Heinrich Hertz, who did so much of the preliminary research in this scientific area. Because the number of cycles per second is so large in most scientific measurements, figures are usually expressed in kilohertz, or thousands of cycles, and megahertz, or millions of cycles.

Looking at the AM radio, we see that the carrier frequencies utilized for transmission are those of 540 kilohertz (540,000 cps) to 1,600 kilohertz. Each AM station occupies a band of frequencies 10 kilohertz wide. The station's call letters are identified with the midpoint of these frequencies. For example, KNX in Los Angeles, 1070 on the dial, actually utilizes 1,065 to 1,075 kilohertz for broadcast purposes.

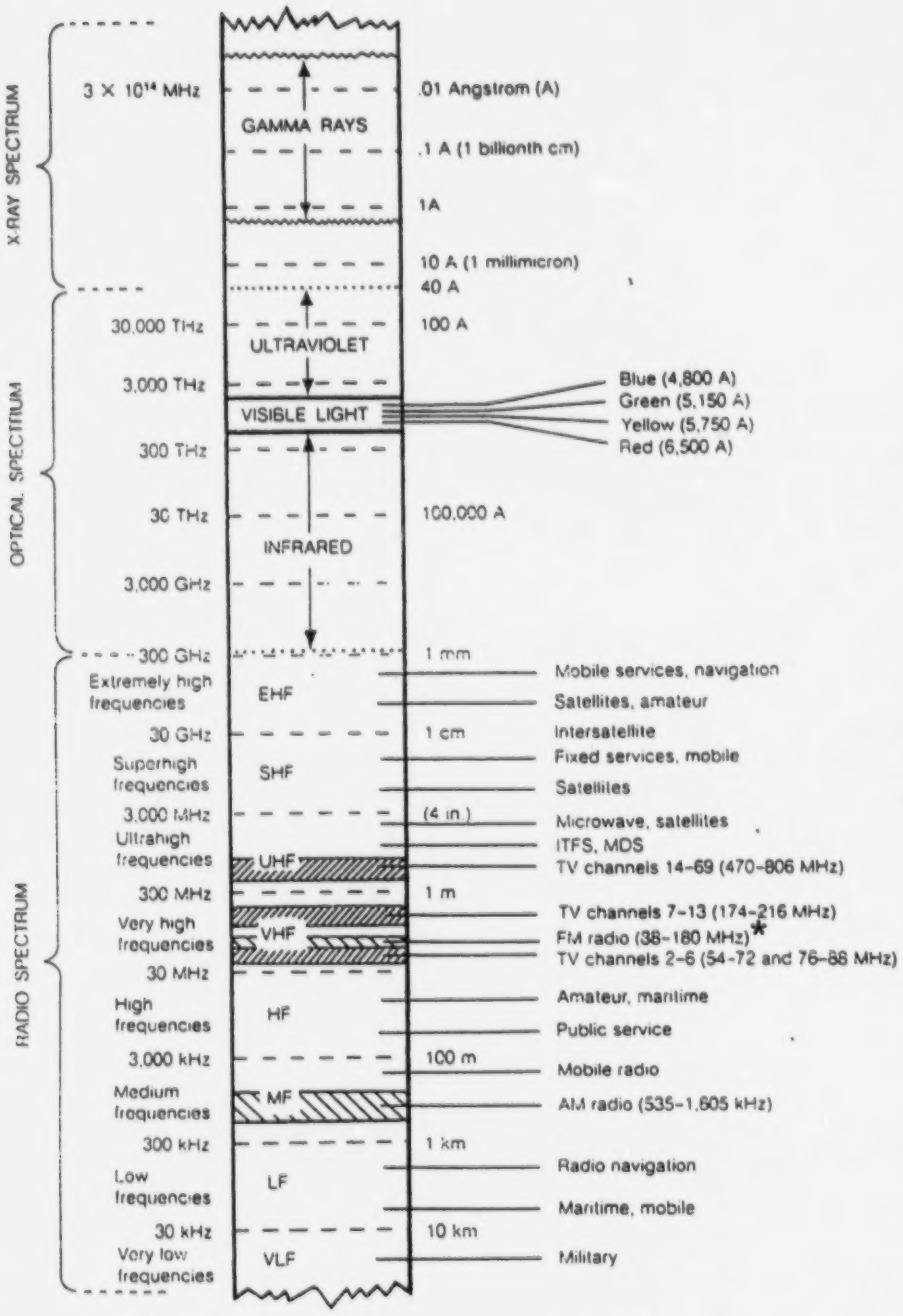
In AM (amplitude modulation) radio the broadcast signal is, in effect, added onto the carrier frequency, and in the process variously alters the amplitude of the signal. It is

this modulation of the amplitude that the receiver translates back into sound. (See fig. A.2.)

FM (frequency modulation) radio uses much higher carrier frequencies, from 88 to 108 megahertz. Here, it is the frequency of the carrier signal that is changed by the modulation process and, in turn, translated or demodulated back into sound. (See fig. A.2.)

As shown in figure A.3, radio and television occupy but a small part of the immense range of the known electromagnetic specturm.

Figure A.3
Electromagnetic spectrum.



* The correct spectrum for FM radio is 88-108 MHz.

Frequency Designations

1 Hertz	(Hz)	=	1 "cycle" per second
1 kiloHertz	(KHz)	=	1,000 Hz
1 megaHertz	(mHz)	=	1,000 kHz
1 gigaHertz	(gHz)	=	1,000 mHz
1 teraHertz	(tHz)	=	1,000 gHz

The entire electromagnetic spectrum includes waves that range from infinitesimally short X rays to light waves measured in angstroms (1 angstrom equals 1 ten-millionth of a millimeter) to radio waves that vary in length from 1 millimeter to several miles. Radio and television broadcast services occupy only a very small portion of the radio spectrum. Most of the electromagnetic space is assigned to hundreds of various services--military, navagational, satellite services; data transmissions, cellular radio, amateur (ham radio), public service, cable TV distribution; fire, police, emergency services; mobile radio (taxis, businesses), maritime, CB radio, aircraft, microwaves, remote telephones; forest services; medical, government, industrial, mobile paging, highway maintenance; short wave; civil air patrol; power utilities; transportation; and on and on.

Source:

Burrows, Thomas D., Wood, Donald N., and Gross, Lynne Schafer. Television Production Discipline and Techniques. 4th Edition. Wm. C. Brown, Dubuque, Iowa. 1988.

APPENDIX C:

DISTANCE EDUCATION GLOSSARY

A DISTANCE EDUCATION GLOSSARY

ANALOG: A communications channel or signal that uses a continuous electromagnetic waveform to convey information. (See DIGITAL)

ANTENNA: A metallic structure used to transmit or receive electromagnetic signals or waves.

ASYNCHRONOUS TELECONFERENCING: Interactive group communication that allows individuals to communicate as a group when all are not present simultaneously. This type of teleconferencing allows participants to join a conference when convenient for them, leave messages for others and receive messages left for them. Computer conferencing is an example of asynchronous teleconferencing.

AUDIO CONFERENCING: The use of a telephone to link two or more classrooms with an audio signal. By using microphones and loudspeakers, audio interaction between sites is possible. K-State's TELENET system is an example of audio conferencing.

AUDIOGRAPHIC CONFERENCING: Teleconferencing that allows participants to share and interact through graphics, figures, and printed text. Hardware includes facsimile, telewriters, and film-based projectors. Transmission is via a narrowband telecommunications channel such as a telephone line or radio subcarrier.

BANDWIDTH: In terms of signal frequency, the range between the lowest and the highest frequencies used to transmit a signal from one site to another. Bandwidth is a measure of an analog signal and is measured in cycles per second. Contemporary units are Hertz (one cycle per second equals one Hertz).

BRIDGE: An electronic device that mixes the signals from three or more locations for audio or audiographic teleconferencing.

BROADBAND (WIDEBAND) CHANNEL: A communications channel with a bandwidth larger than that required for baseband transmission. Very often any channel wider than voice grade is considered to be a broadband channel. Broadband channels can accomodate full motion analog video signals.

BROADCASTING: The transmission of electronic information over radio frequencies (through the air) by a broadcast system.

BROKERS, VIDEO CONFERENCING: Organizations maintaining primary leases or ownership of communications satellite time and providing subleases to other users.

C-BAND: Transmission from communications satellites operating in the 6/4 gigaHertz (gHz) portion of the microwave spectrum (shared with terrestrial circuits).

CAI: Computer-Assisted Instruction, whereby a student interacts with a computer, and the computer responds as a teacher.

CATV: An abbreviation for Community Antenna Television, the term most frequently applied to cable television.

CABLE TELEVISION: A television system that uses cable to transmit or distribute the TV signal.

CARRIER: A provider of transmission capabilities available to the general public, sometimes referred to as a "common carrier" or "regulated carrier," as it is regulated by the FCC.

CHANNEL: A band of frequencies allocated for communications.

CLOSED CIRCUIT TELEVISION: A TV system in which the transmission of the TV signal is limited to only those receivers that are physically connected to the system.

CODEC: An electronic device that converts analog signals to digital form and vice versa. Codec stands for COder/DECoder. A codec is generally made up of a central processing unit (CPU) and memory.

COMMON CARRIER: A communications service, regulated by the FCC, in which ownership of the medium is divorced from control of the message it carries. Telephone is a common carrier; broadcast TV is not.

COMPRESSED VIDEO: Video images that have been processed to remove redundant information, thereby reducing the amount of bandwidth required to send them over a telecommunications channel. This is also called video compression. When motion-video quality is classified as a function of transmission rate, the following categories result: greatly limited motion at 19 Kbps; limited motion at 56, 112, and 256 Kbps; near full-motion at 384 and 678 Kbps; full motion video at 1.5, 3 and 6 Mbps; and near-broadcast motion video at 45 Mbps.

COMPUTER CONFERENCING: The use of computers which are linked through modems and telephone lines (or other means) to each other. Computer users are allowed to freely or systematically interact to share ideas and concepts. With video projection equipment, large groups can view the conferencing process.

CONFERENCE GRADE VIDEO: (See Compressed Video)

CORRESPONDENCE STUDY: The traditional term for non-classroom, home or work-based study using printed materials such as a study guide and textbook with regular written assignments graded by a tutor or course instructor. Such activities usually lead to an examination at the completion of the course.

COURSE TEAM: The multidisciplinary group which plans and produces a distance education course. Content, instructional design, media (video, audio, graphic arts), student assessment, evaluation, and reprographic specialists may be involved in the various stages of course development which likely follows an instructional development model.

DBS: Direct Broadcast Satellite; a means of delivering programming directly from satellites to small receiving dishes leased or purchased by individual subscribers.

DELIVERY SYSTEM: The system which provides a two way flow of information, administrative, and academic materials between a distance education program and its students. The delivery system methods may include postal and courier services, broadcasting stations, cable networks, newspapers, satellites, telephone, teleconferencing, and computer systems.

DIGITAL: A method of representing information using a sequence of ones and zeros for storage and interpretation by a computer. In digital transmission, analog signals that are originally in a continuous form are converted to discrete signals of zeros or ones to be transmitted to a receive site, interpreted, and used to reconstruct the original analog signal.

DISTANCE EDUCATION: The organizational and pedagogical methods of providing systematic education at a distance using various forms of educational and communications technology. The teacher and student are physically separated in space and (often) in time since learning materials (print, media, computer programs) are prepared in advance. Students use the materials at places of their own choosing. Communications media are used to bridge the space and time gap and provide the major interface between a teacher and students. Occasional contact with other students and tutors may be designed into the system.

DOWNLINK: The receive-end of a satellite transmission. Also called earth stations, dishes, VSATs or TVROs.

ELECTRONIC MAIL: A method of communicating messages using computers which provide "electronic mail boxes" for users. The simplest systems used by some distance education programs are electronic bulletin boards; the more complex are commercially operated systems, some with hundreds of thousands of subscribers, such as MCI Mail, the Source, CompuServe, Easy Link, and Bitnet.

ENCRYPTION/DECRYPTION: A digital technique for securing information transmitted over a communications channel with the intent of excluding all other than authorized receivers from interpreting the message. Can be used for voice, video, and other communications signals.

FACSIMILE (FAX): A device that electronically transmits information written or printed on paper. Generally used to convey images (facsimiles) of typewritten forms, printed figures, or hand-drawn diagrams to other sites participating in a teleconference. At the receive site, the image is reproduced on a sheet of paper.

FCC: The Federal Communications Commission. The body designated by the United States Congress for regulating common carriers, broadcasters, and other users of the frequency spectrum.

FIBER OPTICS: A high technology replacement for copper wires and cables used to carry voice (telephone and audio), data, and video signals. The fiber is an ultra pure quartz strand the thickness of a hair. Information is transmitted by laser-generated pulsed light along the fiber rather than by electrical pulses along a wire. The result is an interference-free, multiple channel means to deliver audio, video, and data at the same time to the same place using tiny strands of glass.

FOOTPRINT: The geographic region on the earth that can easily receive and interpret a signal broadcast from a communications satellite.

GEOSYNCHRONOUS ORBIT: An orbit located 22,300 miles above the earth's equator. This orbit allows communications satellites to remain stationary above the intersection of a longitude with the equator on the earth. Because of this, earth stations can be permanently pointed at one location in the sky to continually transmit and receive information from a satellite.

HERTZ: (Named after Heinrich Rudolph Hertz, a German physicist) A measure of frequency, one cycle or complete oscillation of a radio waveform per second.

HDTV: High definition television. Television systems delivering resolution higher than normally seen on home television sets. Generally start at resolutions of 1000 vertical lines or more.

INSTRUCTIONAL DEVELOPMENT: Systematic procedures to translate curriculum plans into courses, materials, and student assessment methods, and to validate the courses during various stages of their development.

INSTRUCTIONAL TECHNOLOGY: A multi-disciplinary field in education and training which draws upon a wide range of psychological and technological tools and principles to maximize learning.

INTERACTIVE VIDEO: A system of individualized instruction which uses videodisc and computer technology to present information which is tailored to the responses of the learner through branching techniques.

ITFS: Instructional Television Fixed Service. A low powered, low cost, line of sight, omnidirectional, microwave TV and data distribution system designated by the FCC for use by educational institutions.

KU-BAND: Communications satellite transmissions in the 12 and 14 gHz portion of the frequency spectrum.

LOCAL AREA NETWORK (LAN): A communications network, usually used for data, but sometimes also accommodating voice and video, that links a small area, such as a building or an industrial park. Most LANs have a maximum link length of less than a mile; most are based on coaxial cable.

LOW POWER TV: Authorized by the FCC for broadcasting to a small geographic area. Because a weak signal is used, LPTV stations can be "squeezed" between existing channels without creating interference.

MMDS: Multichannel Multipoint Distribution Service: a pay-TV delivery service broadcast by microwave to small dish antennas. MMDS is sometimes referred to as "over-the-air cable." (Technically, MMDS is identical with ITFS.)

MICROWAVE: 1. The portion of the radio frequency spectrum at or above 1000 mHz. 2. A terrestrially-based transmission system that uses parabolic dishes separated by distances that allow line-of-sight communication.

MODEM: A device used to accept digital signals and add them onto, or modulate them on, analog signals for transmission between sites. Modem is an abbreviation for MOdulator/DEModulator. A modem acts not only to convert digital signals to be transmitted in analog form, but likewise to demodulate the signals.

NTSC: The North American standard for color television systems. Named after the National Television Standards Committee. Calls for 525-line frames transmitted at the rate of 30 per second.
NTU: National Technological University. A consortium of universities and businesses offering advanced engineering degrees. 601 Howes, Ft. Collins, CO 80521. (303) 484-6050.

PHASE ALTERNATING LINE (PAL): The broadcast television standard in Europe as well as other locations, calling for 625 lines per frame transmitted at 25 frames per second. North American standards call for 525 lines per frame.

SATELLITES: Properly, a celestial body orbiting another of larger size. Commonly used to describe communications transceivers that are in geostationary orbit around the earth.

SEQUENTIAL COULEUR A'MENOIR (SECAM): Broadcast television standard used in France and the Soviet bloc, calling for 625 lines per frame.

SLOW SCAN TELEVISION: A technique of transmitting still video pictures (face of instructor, graphic materials, pictorial matter) by ordinary telephone lines to produce a picture similar to a good quality freeze frame on a video recorder. The picture can change every 6 to 30 seconds depending upon equipment. Slow scan is used for linking remote classrooms together with a base where conventional television links such as microwave are not feasible. A second telephone line is required to allow audio interaction between the various sites.

STAR SCHOOLS PROJECT: The Star Schools Program Assistance Act designated $100 million over a five year period to improve instruction nationwide in math, science and foreign languages. In Kansas, Kansas State University and the University of Kansas are partners in the Midlands Consortium, one of the grant recipients.

SYNCHRONOUS TELECONFERENCING: Teleconferencing during which participants are on-line at the same time. The opposite of asynchronous teleconferencing.

T CHANNELS: A series of standardized data channels, originally devised to carry digital voice. Includes the T1, T2 and T3 channels.

T1 CHANNEL: In North America, a channel that communicates at a data rate of 1.544 mb/s.

T2 CHANNEL: In North America, a digital channel that communicates at 6.312 mb/s.

T3 CHANNEL: In North America, a digital channel that communicates at 46.304 mb/s.

TELECONFERENCING: The general term for linking remote sites/classrooms by video and/or audio connections. More precise terminology is AUDIO CONFERENCING for audio-only links and VIDEO CONFERENCING where video is made available at remote sites from the originating site.

TELECOURSE: A course presented by television using broadcast, cable, microwave or video distribution. The course may be specially created or adapted from existing educational programs. The televised portion of the courses often serves to illustrate and amplify content contained in a course textbook, study guide, and exercises.

TRANSPONDER: That portion of a communications satellite that acts as a receiver, amplifier, and retransmitter for all signals communicated up to and down from the satellite.

TVRO: Television Receive Only, a satellite receiving antenna, also known as a downlink.

UHF: Ultra-High Frequency; TV channels 14 through 69.

UPLINK: A satellite earth station capable of transmitting and receiving information.

VBI: Vertical Blanking Interval; 21 unused lines in the TV signal, which appear as a heavy black line when the horizontal hold slips. Some of these lines are used to transmit teletext, while others are used to transmit music or closed captioning for the hearing impaired.

VCR: Video cassette recorder.

VHF: Very-High Frequency; the TV channels 2 through 13.

VIDEO CONFERENCING: Use of communications satellite technology to link various remote classrooms with an originating site--a studio or another classroom equipped for television origination. The connection also includes audio linkage which allows any site to originate an audio signal. This configuration is called one way video, two way or interactive audio. Advances in technology such as fiber optics are now allowing fully interactive video and audio linkages. A partial stage of VIDEO CONFERENCING uses slow scan television which distributes freeze frame pictures and interactive audio originating from any site with two telephone lines.

VIDEO DISC: A specially configured plastic disc capable of storing data, text, still pictures, moving pictures, and audio. The information is read by a laser beam reflected off the mirrored surface (hence sometimes called "Laser Disc"). Computer access to any stored item is virtually instantaneous and thus the videodisc is used as the information storage based for interactive video learning systems.

VIDEOTEX: An interactive technology that uses telephone lines or a two-way cable to connect the TV set or monitor to a central computer, providing textual information on demand as well as various transactional services.

VSAT: Very small aperture terminal. A satellite dish between 1.2 and 1.8 meters in diameter, typically located at a retail or other remote location as an endpoint of a VSAT network.

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APPENDIX D:

EXISTING AND PLANNED CAMPUS RESOURCES

Existing and Planned Technologies.

A. ORGANIZATION

ESU

The Director of Communications Maintenance (responsible for maintenance of data and telephone systems) reports to the Associate Vice President for Fiscal Affairs. The Director of the Data Processing Center (responsible for all central data processing) also reports to that associate vice-president.

The Director of the Instructional Media/TV Center will (effective June 18, 1989) report to the Director of Continuing Education. This center is responsible for all media support for instruction and all audio and video production for instruction, faculty development, and public service. The center will also be responsible for the satellite downlink when installation is completed.

FHSU

All telecommunications are the responsibility of the Fort Hays State University Computing Center which, in turn, is under the auspices of the university provost. The center is primarily responsible for maintaining the ISN, the CMS (conversational monitoring system) which includes the Professional Office System (PROFS), and the VMA/SP (virtual machine - system program) which runs the library's automated card catalog system. Academic areas currently operating micro labs, administrative areas utilizing micros and mini-computers, and the planned computer graphics laboratory, receive technical support from the center.

Radio/Television/Film is a combination academic and service area. All coursework, scheduling, and faculty development is part of the Communication Department which is under the School of Arts and Sciences. The service function of R/TV/F is responsible for academic television production and maintenance of the closed circuit television system. It is under the Office of University Relations which in turn, reports to the Vice-President for Institutional Advancement.

KSU

Computing and telecommunications are organized under a single office at Kansas State. Media production capabilities are separately administered by the various colleges or departments under which they operate. Although the arrival of the ECC has created a great deal of "pooling" of existing physical and human resources, most will continue to operate according to the individual needs of their respective departments or colleges. The dedicated "Telenet" audio network (37 receive sites state-wide, jointly programmed by Kansas State, Emporia State and Fort Hays State), will be located in the ECC and will become a part of the ECC administrative responsibility. Existing Cooperative Extension and Mass Communications facilities will also be relocated in the ECC, but will continue to report to their respective organization heads or

departments. The current video production facilities in Engineering and Veterinary Medicine will remain in their current locations.

KU

Technologies within the University are managed through three primary agencies. The University Director of Information Resources coordinates the activities of the Telecommunications Department and Computing Services. Computing Services has the primary responsibility for computer operations on the campus. Academic computing is headed by the Director of Academic Computing Services and administrative computing is headed by the Director of the Office of Information Systems. Primary responsibility for telephone and telecommunications services are coordinated through the Telecommunications Department. The responsibility for the development of a video system on the KU campus has been placed in the Office of Academic Affairs. Media Services, a unit within the Division of Continuing Education, provides audiovisual equipment, materials and video playback equipment and operates a video production and editing service. The university operatesradio stations KJHK and KANU and the Audio Reader Network (a radio service for the blind).

KUMC

The KUMC voice and data technologies are Telecommunications responsibilities except the dedicated SNA network. Video teleconferencing will also fall under the Telecommunications Department.

PSU

The Coordinator of Instructional Media reports to Dean of Learning Resources.
FM Radio - KRPS Organization: Station Manager reports to Vice President for Development and Public Information. Member of NPR - receives Programming from Westar IV.
CATV Organization: Department of Communication, College of Arts & Sciences

WSU

Five service centers on the WSU campus are making distance learning a reality. Each area reports directly or indirectly to Dr. Joyce Scott, the Executive Vice President for Academic Affairs. The Division of Continuing Education, The Media Resources Center, Ablah Library, and The University Computing and Telecommunications Center report directly to the Vice President. KMUW Radio is a division of the Fairmount College of Liberal Arts and Sciences, which, in turn, reports to Dr. Scott.

B. FACILITIES

ESU
Emporia State has a full 3/4" production television studio with post-production resources. They have full use of Channel 8 on Emporia Cablevision with the capability of originating programs in the studio or in almost any location in the city served by cablevision. They have video/audio trunk line cables connecting almost all buildings on the campus. They are in the process of completing this trunk line system and connecting three to five rooms in each academic area, plus the memorial union and a number of administrative areas. This entire system will connect with a new satellite downlink. They also have a small van for use in video field work. They also have audio recording studios in the media center. These audio and video resources are used primarily for the production and distribution of telecourses, instructional support materials, public service programming, and a variety of institutional materials for faculty development, administration, student recruitment, etc.

FHSU
The production facilities are used for both the academic and service functions of the department. This consists of a 35 X 45 foot studio with complete lighting and dimming system, three studio cameras, two independent sets of field gear, a fully functional control room with A/B roll capabilities, two edit bays, and a computer graphics system with paint box, animation, and digitizing system. Audio consists of two production rooms, a radio control room, two double-track ATRs, compact disc and cassette players, and a complete set of production music.

Fort Hays State University maintains both a student-operated radio and television station. KFHS-TV Radio operates as a carrier current on the AM band and is also on the FM band via the local cable system. KFHS-TV is on channel 12 on the local cable system. Both are used as learning laboratories for Radio/TV coursework.

KSU
Each existing facility has multiple camera (studio) production capability as well as mini-cam field production capacity. Most mastering is on 3/4 inch, though both Engineering and Cooperative extension have BetaCam broadcast 1/2 inch equipment. The ECC, which will break ground on its 32,000 square foot building in March and take a year to construct, will include six studios, a uplink capability, and will master on one inch, with BetaCam broadcast 1/2 inch capability as well. One on-line (one inch and BetaCam) and three off-line (BetaCam) edit suites will be housed in the building, and both the mobile unit and the uplink vehicle will have on-board editing capability. Type five 3/4 inch capability will be included in the ECC equipment to permit interface with existing 3/4 inch material produced by other facilities. No origination or mastering on that format is planned at ECC.

KU

Centralized computing is housed in the Computing Services Facility. Various campus facilities are linked to the facility and its computers via a distribution network. Telephone and other telecommunications services are housed in the Telecommunications building. Most media activities are coordinated through Media Services which is housed in five different buildings on and off the campus. The primary responsibility for television resides in the Production Services unit within the Media Services operation. Most video production activities are done on location. There is no television studio on the campus. One television classroom is located in a 175 seat auditorium in Strong Hall. Post production editing is located in Continuing Education, Annex B. The Radio-Television Department has limited video equipment and a small studio which are used for instructional purposes only in teaching students within the program. The School of Law has a remote controlled video recording system in the moot courtroom for recording and playing back student presentations. Facilities for a television studio, video post production, and audio editing are included in the Dole Building which is under construction.

KUMC

Audio Visual Services operates a video studio and closed circuit TV system linking auditoriums and classrooms on the KUMC campus. KUMC operates a microwave system transmitting audio/video television signals and five subcarriers at 3KHz bandwidth between the Medical Center and the Veterans Administration Hospital in Kansas City.

PSU

The Tape Laboratory facilities have 70 Carrels, 40 with record/playback facility and 16 with color campus cable TV system.
The University computer lab, Teacher Education computer lab, Kelce School of Business micro lab, School of Technology microcomputer lab, College of Arts & Sciences microcomputer lab, Axe Library terminal and microcomputer labs, and various departmental terminals and microcomputer labs.
CATV has one channel that covers Pittsburg and surrounding area. Data facilities available include telephone (dial) access to various off-campus networks. The TV production facilities are used for both the academic and service functions of the department. A 20 x 21 foot studio with two studio cameras, field gear, a functional control room with U-matic editing make up the television production.

WSU

The Media Resources Center (MRC) houses the University's television and media operations, including Wichita State's cable television station, WSU 13. Television studios, graphic and photographic production areas, audio facilites and satellite video reception terminals are located in this two-year-old, 2000-square foot facility. The building houses two production studios (30' X 40' and 40' X 60'), two editing suites, five student editing rooms, set storage, mobile storage, master control,

telecast operations, and a technical repair suite. A new mobile production truck (cab and 16-foot box) allows multiple-camera producation on campus and at the Wichita City Council chambers.

The University operates WSU 13 on Wichita's Air Capital Cablevision system. The channel delivers 126 hours per week of educational programming to 88,000 homes (approximately 200,000 persons) in Wichita and surrounding communities.

The Media Resources Center operates five satellite downlinks (three C-band and two Ku-band) for educational communications applications.

The Division of Continuing Education's administrative offices are housed in Morrison Hall. The conferencing facilities are located in the Marcus Center, adjcent to the University Alumni and Faculty Club. The facility's current capacity is 600 students. Eight classroom are wired for video reception from the Media Resources Center. The University has recently received a gift of $2,000,000 to remodel and expand the Marcus Center, a project which will increase the teleconferencing capabilities of the facility.

The University's Ablah Library will dedicate its new 133,400 square foot facility in October of 1989. The new structure is extensively cabled to allow for voice, data, and video interconnections between campus, community, state and national users.

KMUW, the University's 100,000-watt radio station is housed in Blake Hall, a 10,000 square foot facility, which contains two production studios, and several offices.

The University Computing and Telecommunications Center occupies the first floor of Neff Hall and approximately 800 square feet in the Power Plant Building. The Neff Hall facilities provide space for 29 full time staff and 20 to 25 student employees. The administrative office, administrative programming, technical support programming, academic support programming, and the main computer operations are all located in Neff Hall. The center maintains over 700 mainframe terminals and over 1100 micro computers for the institution. The telecommunication support office is located in the Power Plant Building and provides space for three staff members.

Two main-frame computer terminal rooms, supporting over 60 terminals and two printers, are located in Neff Hall and these two rooms provide the main terminal facilities for open access computing for the campus. These two computer rooms are open seven days a week, 24 hours a day, every day of the year for any student, faculty, or staff member of WSU. Approximately 6,000 computer accounts are currently active in the support of the administrative, instructional, and research activities of the University.

A micro computer laboratory, containing 20 computers and 10 printers, is also located in Neff Hall and is used for classroom instruction as well as being generally available for students during posted hours.

Two telephone switch operators are located in the Neff Hall facilties and provide general telephone operator support for the entire campus during the 8:00 a.m. to 5:00 p.m., Monday through Friday, operation. The entire computing and telecommunications operation is slated to move into the new Science Offices Complex. Ground breaking is scheduled for March of 1990 and construction is targeted for completion in early 1992.

PROGRAMMING

WSU's Media Resources Center and The Division of Continuing Education work cooperatively to offer credit courses to the distant learner, via the University's cable channel, WSU 13. Programming includes ten to fifteen television courses per semester offered for credit by various academic departments. In calendar year 1988, four of WSU's six degree granting colleges offered telecourses. Eighteen courses were offered to 816 graduate and undergraduate students, for an average of 45.3 students per telecourse. The Spring 89 semester enrolled 671 students in eleven telecourses. All of the telecourses broadcast on WSU 13 are purchased programs. Some have been made available through KAPSET, a consortium of 23 Kansas colleges and universities that use, or are interested in utilizing, television courses.

A new project for Spring 1989 is the videocassette rental of WSU telecourses. The telecourse videocassettes are designed to serve students who live outside the WSU 13 signal area. The student receives three videocassettes containing all the video lessons for the course and has the use of the cassettes for the duration of the semester. During the first semester of this service, ten percent of the telecourse enrollees took advantage of the telecourse rentals.

WSU 13 also features distinguished guest speakers, fine arts performances and other campus events produced for television. Examples of locally produced programs in 1988 included an award-winning documentary of the University orchestra's performances in Europe, interviews with thirty faculty artists and overviews of the biennial faculty art show, and a live broadcast of the Wichita Jazz Festival.

The channel is affiliated with and receives by satellite the nationally delivered programs of the Discovery Channel, the U.S. Chanber of Commerce's BizNet, and Campus Network.

In FY 88, the MRC and the Division of Continuing Education serviced twenty-five campus and external clients by providing satellite reception of nationally distributed teleconferences. External clients included Boeing, the Kansas Bar Association and the local association of piano teachers. Campus clients included the Institute fo Aviation Research, Continuing Education, the departments of Journalism, Industrial Technology, the Language Lab and the Library. Through the first six months of FY 89 the MRC has downlinked 19 teleconferences and has reservations for 15 teleconference dates.

WSU is a member of the National University Teleconference Network, an association of 120 universities formed to enable and coordinate national video teleconference origination and reception by its members.

WSU is a receive site for NTU (National Technological University) engineering courseware. The courses are currently downlinked at the MRC and are routed by cable to the Marcus Center for viewing. With the new ITFS system in place, the courses will be broadcast directly to work sites (Boeing, etc.). A priority for the Divisionof Continuing Education is to develop a consortium of NTU business users in the Wichita area.

While WSU is primarily a receive site, one national teleconference has originated from the campus. Dr. Gerald Graham, R.P. Clinton Distinguished Professor of Management, presented a "Strategic Planning and Communication" conference which was received on eighteen campuses across the country. The conference was coordinate by the Division of Continuing Education and the MRC and was made possible with technical support from KSNW, the local NBC affiliate.

The Division of Continuing Education additionally develops programs for nontraditional students and assists the University in providing services to surrounding communities. The Marcus Center for Continuing Education offers noncredit courses ranging from preretirement planning to the arts and sciences. Nearly 45,000 people participate in more than 500 activities held each year at the Marcus Center. A TELENET drop is installed at the Marcus Center, but the service has not been used during the last year.

The University Library contains more than two million items. The library not only serves students and faculty, but also provides information statewide. In FY 88, the library loaned materials, through local libraries, to residents of 94 of Kansas' 105 counties.

KMUW, licensed to The Wichita State University, operates at 100,000 watts at 89.1 FM with a 24-hour-a-day schedule of arts and news programming. The signal is broadcast to an area within a 60-mile radius of the campus and includes a total cumulative listening audience of 26,000 per week. KMUW is affiliated with National Public Radio. The station, currently celebrating its 40th year, is recognized for its classical and jazz programming.

The Wichita Radio Reading Service (WRRS), a subsidiary of KMUW, is broadcast on a subcarrier channel and serves the print handicapped. WRRS' programming consists of volunteers reading the daily newspaper and various magazines. These services are supplemented by programming from NPR and In-Touch Network.

KMUW and WRRS are a part of the Elliott School of Communication within the Fairmount College of Liberal Arts and Sciences and, as such, offer many students broadcasting experiences.

The University Computing and Telecommunications Center provides contemporary computing facilities in support of the administration, instruction, research, and public service activities of the institution. Services include systems analysis and design, programming, time-sharing computing, batch and remote printing operations, main-frame and micro computing consulting, and several on-line transaction oriented administrative data bases. End-user assistance is available for both main-frame and micro computer applications. Consultation with users in their preparation of requests of competitive bids for service and the acquisition of computer equipment is also provided by the Center. The IBM electronic mail system PROFs has been selected as the standard for the institution.

In Fiscal Year 1988 over 800 project number accounts were supported by the Center with over 203 differenct classes utilizing the facilities. These projects allowed 8,472 students direct access to the Center's computing and support services. A telephone modem pool allows off-campus access to all computing services available, including the Library's card catalogue system, classroom programming assignments, and electronic mail services. The international computer network BITNET is available to the campus and is used heavily by faculty to communicate with over 1200 universities throughout the world.

The telecommunications staff provides voice and data services for the entire campus. Over 2000 voice connections, 300 data connections, and general telephone support services are provided.

C. STAFF

ESU
The staff consists of two civil service technicians and a large number of student assistants. The director of the center spends approximately 3/4 of his time on these activities and the department secretary devotes almost half of her time to this effort. The staff involved with voice and data operations includes 16 people. One person in the university library is responsible for the operation of a FAX machine.

FHSU
Radio/Television/Film: At the present time, the department has three full-time civil service employees who handle clerical and engineering responsibilities, three full-time faculty members who teach classes and handle all service requirements, and approximately seven part-time production assistants, office personnel, and computer artists.

Computing Center: Presently the Computing Center has 15 classified and unclassified employees and 21 student/workstudy employees.

KSU

Current staffing includes four FTE at Telenet, four in the Radio-TV production wing of Cooperative Extension, six (including faculty) in Mass Communications, three in Engineering, four in Veterinary Medicine, and three at the ECC. The ECC is currently adding four FTE for "Star Schools", and will add seven FTE in July. Telenet receives some state support (to help pay for the dedicated line charges) but is primarily financed by the three participating universities and user fees for services performed. The other campus media departments are line items in their departmental budgets, though some perform services for rate card fees to other campus departments or organizations. The ECC funding is a combination of state and federal, with building construction and some equipment provided by a $5.915 million grant from the U.S. Department of Education. Year one of "Star Schools" is funded by $5.5 million (also from USDE), of which approximately $700,000 comes to the ECC. Operations are supported during the 1988-89 year with $200,000 in "Margin of Excellence" funds, with an additional $300,000 in "MOE" scheduled to be added next year. The ultimate plan is for $750,000 in annual operations to be funded by the State, with the remainder of the budget generated from user fees. Methods of assuring sufficient funds for maintenance and capital equipment replacement are under development.

The ECC, as a Regents facility, is subject to policies and procedures developed by COPS, COCAO and CODDCE. Its rate card charges will be determined by the amount of operational funding provided by the state, and will be the same for all regents institutions.

KU

Media Services has a staff of 9.5 FTE. Televisionproduction services are provided by a half time unclassified employee and a part time student.

A television producer/director and an Instructional Designer have been employed, as a part of the Star Schools grant, to design and direct instructional television programs. These personnel are a part of the staff of the School of Education.

Computing Services has a permanent staff of over 100 and a student staff of about 60.

The Telcommunications Office has a staff of 4 unclassified, 19 classified, and 6 student employees who are responsible for all telephone services on the campus.

KUMC

The office of Information Systems is staffed with 56 FTE. The Department of Telecommunications is staffed with 24 FTE who are responsible for customer service, installation and maintenance of voice, data and fiber applications. Additionally, Telecommunications operates a 24 hour per day, seven day a week switch board providing physician answering service, computerized paging in addition to the classical switchboard functions. Audio Visual Services is staffed with 27.5 FTE.

PSU
Staffing consists of one full-time technician, five OIM staff available as required, and five student employees.
The computer operations have a staff of 12 full-time Information Systems personnel and 18 part-time student personnel.
FM Radio - KRPS has 5 full-time staff and 15 part-time staff (10 PSU Students).
The CATV staff has one full-time faculty member and students from Department of Communication Classes.

WSU
Of the twenty-one full time staff employed by the MRC, eleven have television production responsibilities. Those positions include:

- Associate Director for Television Services
- Manager of Channel 13
- (2) Producer/Directors
- Video Editor
- Audio Producer
- Graphic Designer
- Chief Engineer
- (3) Electronic Technicians.

It is important to note that three of the positions--the video editor, the audio producer, and one of the video producer/directors--are not state funded and are supported by revenue generating projects.

The Division of Continuing Education employs five professional staff and nine support staff.

KMUW radio employs six full time staff and thirty support staff.

Ablah Library employs the following:

	Faculty (FTE)	Staff (FTE)
Acquisitions	1	4
Administration	2	2.5
Cataloging	4	10
Circulation	1	8
Collection Development	3	1.5
Reference	10	4
Special Collections	1	1

FTE Students = 23.2

Thirty-two full-time staff members and twenty part-time students are employed by the University Computing and Telecommunications Center:

Administration	4
Academic Programming	4
Administrative Programming	10
Operations	5
Technical Support	5
Telecommunications	4
Total FTE	32

D. 1. EQUIPMENT

A detailed list of television equipment owned by the various institutions is found attached to this report as Attachment 1.

ESU
See attached detailed list.

FHSU
See attached detailed list.

KSU
The initiation of "Star Schools" programming has accelerated the acquisition of broadcast quality production and satellite delivery capability at Kansas State. The ECC began fixed uplink operations May 1, 1989, and will take delivery of its transportable uplink at about that same time, and the mobile production unit by the end of the summer. Pilot programming began in late spring, and full academic year programming will begin in the fall of 1989.

KU
See attached detailed list.

KUMC
The Medical Center recently submitted an application to the FCC for low power television. We are also exploring the feasibility of a PC based, Audio/Graphic/Video Imaging System to link off campus sites. Boston University Medical Center uses this technology for consultation, long distance learning for cardiology, histology, radiology and pathology.
See attached detailed list.

PSU
See attached detailed list.

WSU
The Media Resources Center's current format for broadcast production is 3/4-inch. A new post-production package will provide a Beta-SP component for shooting, and the editor will have Beta-SP, 3/4-inch, and 1-inch machines for editing. The new editing suite will also contain a Pinnacle graphics system with DVE/stillstore/paint/animation/and 3-D capabilities. Two fully-equipped audio studios are available in the Fine Arts complex, for recording music events. The M C uses a portable R-DAT audio unit to record the Wichita Symphony, for broadcast on KMUW radio.

2. PROTOCOL

KUMC
The Medical Center Information Systems Network (ISN) supports the following standards, IBM BSC, SNA/SDLC, IDO standard HDLS and 3270 Type A coax protocals, Ethernet/IEEE 802.3, TCP/IP, XNS, DECnet, 3Bnet, RS-232C and asynchronous protocols.

PSU
Standards/Protocols are RS 232 (async) terminal protocol, ISO OSI standard network communications protocol (802.3)

WSU
The University Computing and Telecommunications Center supports both an asynchronous and a synchronous data network. Several remote asynchronous dedicated circuits are supported using a Comten 3650 front-end communications controller and 4800 or 9600 baud modems. Twenty-five channel attached terminal controllers which can support up to 800 synchronous terminals are also supported. Two of the controllers are connected to the data center utilizing fiber optics distribution media. An IBM 7171 protocol convertor, with 64 ports, is used to allow asynchronous terminals access to the IBM network. The ISN data switch is used to provide forty ports concurrently to the IBM network and eight ports to the ethernet DEC network. A modem pool of sixteen modems is available for both in-coming and out-going communications applications. Approximately 100 other asynchronous terminals are directly connected to either the IBM or DEC networks in a dedicated manner.

E. 1. EXISITING DATA CAPABILITY

FHSU

The library system was actually the first department to implement a computer data-base system for non-administrative purposes. The system was made possible through a Title Three grant and was implemented over a three year period.

A Notis software package was purchased which allows the card catalog to be accessed through the data-base system. It is designed to do reference searches and has the ability to be accessed off-campus via a computer modem.

Any building on campus with access to a dumb terminal or computer with terminal emulators also has access to the system. However, terminals within Forsyth Library are bisynchroneous which makes access to the Kansas Data Network impossible from these workstations.

Completion of a license agreement between Fort Hays State University and Kansas College of Technology has recently been completed. This allows KCT access to TOPCAT, an acronym for Tiger On-line Public Catalog, which allows them to make use of Forsyth Library resources.

With recent advances in facsimile machines, library service has also been able to include interlibrary loan services utilizing the Omnifax group 3 machine. Approximately 25 libraries are on the system and include regents schools, large and small public libraries, and community colleges. The service is free of charges with communication surcharges being absorbed by the university. However, administrative use does include a charge but has not been used significantly for that purpose. The Kansas Library Board has considered the fax network an unheralded success.

One of the most progressive programs involves English composition classes using a computer main frame software package called Writer's Workbench. Students can compose English themes then receive an instant evaluation of structure, syntax, grammar, and spelling. This allows students to concentrate on style and the instructor is free to become more involved with the creative processes of writing and less on grading and evaluation. An added advantage of this system is the ability to integrate with any class requiring writing regardless of discipline.

Another part of the system for use by faculty and staff is Profs, an acronym for Professional Office Systems. Instant access to student information, accounting, alumni records, individual calendars, and inter-office communication is available. The system is accessible from any terminal or personal computer with a terminal emulator. Individual access is available only by using user identification numbers and passwords.

Mainframe hardware includes the following: IBM 4381 MODEL 14, AE-4, AD-4, 3375A, 3375B Disc Drives; VSE GUEST operating system

Mini-computers include the following: AT&T 3B15, 3B600, (2) 3B500, 3B300; UNIX Operating System.

KU

The three major mainframe computers are a National Advanced Systems NAS 8043, installed in 1985; an IBM 3031AP, installed in 1979; and a Digital Equipment Corp. VAX 8650, installed in 1986. The NAS 8043 is the primary administrative computing system. The IBM 3031AP is shared between academic (research and instruction) and administrative users. The VAX 8650 is the primary system for academic use. Users communicate with these systems by way of a complex set of communications networks. Most administrative users have terminals or mircocomputers with coax attached synchronous interfaces. Academic users typically use dial-up or twisted pair asynchronous interfaces. The campus premise distribution wiring system is also used on both academic and administrative systems. An X.25 network which was initiated in 1983 was expanded and is the primary mode by which users will interface to the central systems.

Currently there are 8 shared logic word processor systems in use. These systems include: NBI System 64; Wang OIS 50; MicroVax II; Xerox 6085. The 62 departmental minicomputer systems include: IBM 36; Data General MV8000; Raytheon Data Systems 500; Prime 850; DEC VAX 11/750; DEC VAX 11/780; DEC PDP 11/55; Harris H-800; Harris H-1000; PDP 11/23's; Applicon AGS 875 DEC PDP 11/34); VAX Station II's; VAX Station I; AT&T 3B15; AT&T 3B2; SUN 2; Xerox 1108 Lisp; IBM System 34; Data General Nova III; LISP Symbolics 3670; Symbolics 3620; SUN 3; INNOVACQ System; Altos 586; Evans & Sutherland PS330.

More than 2300 microcomputer systems have been added on campus since 1983.

KUMC

The KUMC has developed an extensive voice and data communications network through the AT&T System 85 PBX, Information Systems Network (ISN) and the SNA dedicated data network. The ISN asynchronous data network links the Lawrence and Wichita campuses with KUMC. The SNA Host computer is also linked to the Lawrence HOST and the ISN asychronous network.

PSU

The central computer system utilized a Prime 9955 Computer with 16MB main memory, 800/1600 BPI Tape drive, 1.892 GB Magnetic Disk, 154 Serial Ports, Primos OS, Prime Information data base management Prime 750 Computer with 8MB main memory, .615 GB Magnetic Disk, 64 Serial Ports, Primos OS, standard compilers ATT 6386 microcomputer with 6MB main memory, .135 GB Magnetic Disk, .125 GB cartridge tape, 8 serial ports, UNIX OS, StarGROUP Ver.3.1 network management system ATT ISN with 1 AIM (8 port serial) card, 1 TIM (Trunk Interface Module), 2 DSU (Data Service Units) Apple Macintosh II microcomputer with 2MB main memory, 80 MB Magnetic disk, Appleshare network management system

The type of cabling used and the bandwidth available in the existing system are Twisted pair (48,000 feet) 9.6 kBps and Fiber Optic (12 pair - 6,800 feet) 10 mBps per strand

WSU
The University Computing and Telecommunications Center has two central processing units, an IBM 3081 model D-16 with sixteen million characters of main memory, and a VAX 8650 with thirty-two million characters of main memory. Eight 1600/6250 character-per-inch magnetic tape drives, a 4,000 lines-per-inch line printer, and an off-line digital plotter are available for general use. An NCR Comten communications processor, twenty local CRT controllers and a network of 1,105 microcomputers and more than 500 graphics and CRT terminals provide interactive computing for campus classrooms, laboratories and offices. These terminals are used with the academic time-sharing system (CMS), computer graphics, computer assisted instruction, and the administrative terminal system (CICS).

The installation of the AT&T Information Systems Network (ISN) was accomplished during the past year. The ISN will provide the networking data switching to allow the University to fully utilize the premise distribution system (System 85) installed the previous year. Over 300 terminal end points are now supported using the ISN to connect microcomputers and other asynchronous terminals to the campus network. Currently 40 ports are connected to the IBM mainframe using an IBM 7171 protocol convertor with fiber optics used to connect to the ISN. Modem pooling on the ISN is available for both on-campus as well as off-campus use. The interlinking of the ISN service between Regents institutions is anticipated.

The use of the international electronic mail system, BITNET, has continued to increase and provides services to over 100 faculty in support of instruction and research activities.

WSU's Ablah Library increasingly depends on computer based systems for information exchange. OCLC, based in Dublin, Ohio, provides a national data base for the electronic exchange of bibliographic information. KIC, the Kansas Information Circuit, administrated by the State Library, is a micro-based system which aids in the processing of inter-library loan. The NOTIS software package, which allows for acquisitions, cataloging, and circulation is used by Ablah and three other Regents libraries. There is discussion to link the programs. The NOTIS program information is available to anyone with a modem-equipped PC. Several of the Regents libraries are launching a fax network.

E. 2. EXISTING VOICE CAPABILITY

ESU
ESU has no real data network at this time. Terminals are directly connected to their host computer and have no interaction with each other. The two central processing units are stand alone units and do not share any resources at this time.
The computer center is operating in a non-"SNA" environment. There is a possibility that we may convert to SNA eventually, but, for now, the advantages are not cost effective for ESU.

The telephone, or voice, network centers around the campus PBX. The administrative and academic buildings are completely wired for voice/data communication via a twisted pair wiring scheme that delivers four pair of wires to each telephone jack.
The residents halls are not connected to the campus system and have their own systems thru S. W. Bell.
The Campus PBX is a "Northern Telecom SL-1N" and had 9 tie lines for KANS-A-N and out going long distance service, 10 DID trunks for incoming calls to individuals and division centers, 14 two-way trunks for out going local calls and incoming calls to the campus operator, and numerous private two-way trunks.

KU
Voice capabilities include a campus-wide telephone system and access to the KANS-A-N network.

KUMC
The KUMC has developed an extensive voice and data communications network through the AT&T System 85 PBX, Information Systems Network (ISN) and the SNA dedicated data network. The voice system includes voice mail, modem pool and conference bridging.

PSU
FM Radio - KRPS has a coverage area of 80 miles radius, audiences of approximately 405,000 persons in coverage area, and an antenna/power of 100 Kw, 1050 foot tower - Weir, KS. The station is on the air 24 hours a day.

WSU
The AT&T System 85 digital telephone system at WSU provides over 1200 voice lines and over 200 telephone instruments. Twenty-two KANS-A-N lines and ten WATS lines serve the long distance needs of the campus. Every student dorm room has been provided a telephone.

E. 3. EXISTING VIDEO CAPABILITY INCLUDING FIBER AND COAX

ESU
There is no fiber on our campus nor are we linked with any other external agency by this means. We have in place coax and conventional lines which connect all buildings on the campus for video, audio, and data equipment.

FHSU
Two nodes were installed in May of 1987 concurrent with the University's commitment to the development of a fiber optic network. Presently only four building are wired with fiber but eventually plans are to include

the entire campus. Buildings wired with copper have long reached their capacities making expansion impossible. The fiber network, along with buildings presently wired with copper, is exclusively used for data transference but the long range goals are to include video transmission capabilities as well.

The ability to transfer data between regents institutions has been discussed as a necessity to adequately make use of all available resources.

Public and commercial television has also been utilized as a method of delivering telecourses but it is found that rigidity in programs schedules make it less than desirable. Most telecourses have been telecast in the early morning or late evening making viewing inconvenient. In addition, most stations have a limited coverage area or are inaccessible unless located on the local cable system. In any case, participation has been low. The following television stations have participated: KOOD-TV, Bunker Hill; KLBY-TV, Colby; KTVC-TV, Ensign; KAYS-TV, Hays.

A possible alternate to this has been through the experimentation of individual tape delivery. The office of Continuing Education has experimented with approximately 20 households enabling discretionary viewing but is restricted to those households with access to a videotape machine. In addition, dubbing, tape, and postage costs make it less than cost-effective. Another alternative to individual tape delivery has been through the distribution of courses at the off-campus centers. These are located at Barton County Community College, Dodge City Community College, Garden City Community College, Seward County Community College, Colby Community College.

A majority of the telecourses are purchased from outside sources, however, with the implementation of a feasible distribution system, it is intended to increase the activity of "in-house" telecourse production. In the past, several telecourses were developed varying from 18 to 37 hours of televised material. Formats also ranged from an ineffective "talking head" to a formal presentation designed specifically for television and implementing a wide range of production elements.

Radio/Television/Film has been in existence at Fort Hays State University since 1951 making it the oldest broadcast department in the state. Academically, the department offers classes in production, promotion, sales & management, cinematography, and electronic journalism. As an area under Communication, Radio/Television/Film has between 75 to 100 majors every year and maintains a campus radio and television station used exclusively as a learning laboratory. The department has the capabilities of dubbing VHS, Beta, U-Matic (standard and SP), and film to tape transfer. Production includes, in addition to telecourse presentations, everything from recruiting tapes to classroom lectures. The closed circuit television system maintains 5 cable channels which are wired by coax to all academic builidngs. A list of 1041 video tape titles are cataloged and scheduled by individual instructors for playback at a particular time. During the previous school year, over 1400 playback were scheduled reaching over 57,000 students.

KSU
While the exact "main-frame" type and capacity have yet to be determined, the system for organizing and interconnecting the computing and telecommunications needs of the campus has been developed, and a network of fiber optic cable was installed during the 1987-88 year. Consisting primarily of four, six and twelve strand cables, the network connects 55 campus buildings, through a "home run" system running through the campus steam tunnel system to the power plant.

KU
Video capabilities include productions formats in 3/4", 1/2" VHS, and 8mm. Playback formats include 3/4", 1/2" VHS, 1/2" Beta, and 8mm. One mobile, 5 meter C band satellite downlink is available for use throughout the campus. Steerable, fixed C band downlinks are located at Wescoe Hall, a humanities building, and at Learned Hall, the School of Engineering. A C/Ku band downlink has been installed, as part of the Star Schools project, and will be connected to the fiber optic system for distributing the signals to various campus locations.

KUMC
All major campus buildings are connected with fiber optics.

PSU
Building interconnection via a Closed Circuit Television utilizes a coaxial cable system with broadband amplifiers. The Campus TV Intercom system is a twisted pair 'party line'. Seven channels using rf are currently available. Receiving points currently include 188 Rooms in 10 Buildings (29 Student Carrels).

WSU
CAMPUS VIDEO DISTRIBUTION: The campus coax network continues to expand, with delivery now possible to eighteen campus buildings. The campus head end, located in the MRC, is the origination or switch point for four of the 35 channels on the campus system:

Channel 2	Delivers NTU programs to the Marcus Center for Continuing Education
Channel 5	Delivers telconferences to campus buildings
Channel 6	Delivers foreign language programs to the Language Lab in Jardine.
Channel 13	Delivers telecourses, the Discovery Channel and other programs to Air Capital Cablevision, distributing city wide and on the WSU campus.

The campus cable system is, in large part, capable of two-way transmission. Two cables, originating in the MRC control room, are connected to many of the campus buildings. One cable carries 35 TV channels (including 2, 5, 6, and 13) out from the MRC to eighteen campus

buildings. A second cable, available in eight locations, allows a signal originated in that location to be returned to the MRC. As a complement to this system, several performance and lecture halls on campus are being equipped with conduit and camera positions to allow for easy multi-camera programming access.

F. PLANNED TECHNOLOGY

ESU

Once our down-link is installed we consider our campus-wide video/audio system to be complete as planned. No expansion or changes in this system are planned for the immediate future.

We have ordered and will soon install an AT&T ISN network switch. This will provide connected devices the ability to "dial" a connection to various other devices or resources connected to the network.

Within our own campus environment, we have tentative plans to implement a number of smaller networks for divisional use.

Admissions will have a small LAN using arcnet hardware and Novell software for the purpose of processing student inquiries, applications, etc.

Academic Affairs has plans for a small AT&T StarLan to connect the Deans' offices and Academic Affairs offices together.

University Relations and the ESU Press want to network their desktop publishing systems together using some form of an Apple LAN.

Academic Affairs is also sponsoring a LAN in the library for student use. This LAN will provide two software programs, Writer's Workbench and Documentator's Workbench that should help students to write better.

FHSU

The future plans of the library include expanding the computer information networking system to include schools that are members of the Western Kansas Compact. In addition, the ability to load information from external data-base systems and CD ROM is being analyzed.

As it is currenting viewed by most administrators, the future of continuing education in western Kansas is based on the ability to distribute course material via an efficient, accessible and cost-effective channel. Various systems have been evaluated and have been deemed too costly as in satellite delivery or too restrictive as in microwave relay.

Future plans for the Radio/Television/Film Department are to become more actively involved with the development and production of telecourses. It is our intention to retain as high quality as money will permit, constructing in the near future an off-line editing suite with computer-based time code editing, digital effects, and enhanced graphics workstations. It is also imperative that the aforementioned network be designed to include the transmission of real-time video making proper use of existing capabilities at Fort Hays State University and other regents institutions.

KSU

Although "Star Schools" has identified the ECC's satellite uplink capability prominently, the ECC is actively engaged in a wide range of communications technologies, including fiber optics, compressed video, audio graphics, low power TV, ITFS, and cable television. Its operational philosophy with respect to distance education is to match the most cost effectice appropriate technology to the content requirements of the message, rather than to force the content into existing or available technologies.

KU

Applications have been made to secure FCC licenses for a low power television (LPTV) system to permit one way video and audio to be directed to the Kansas City metropolitan area. Broadcasting equipment will be purchased as soon as the necessary licenses are secured. An audio bridge has been purchased to provide a return audio link to the Lawrence campus. Transmission links between the Lawrence campus, the Medical Center, and the Regents Center are needed to permit the three locations to transmit and receive programming to and from each other.
The "Star Schools" project is funded by the Midlands Consortium, of which KU and KSU are a partners. This project accentuates the need to electronically link the Lawrence and Manhattan campuses. Initially, the primary need is for a one way, full motion video plus audio link from Lawrence to Manhattan. There would be many additional benefits derived from having a two way link between the two campuses. The link needs to be full motion video with audio for instructional materials to be transmitted from the KSU Educational Communication Center via satellite to schools.
Compressed video and voice-only links could be used for teleconferencing and other purposes between all regents institutions and between other state agencies. In some instances, full motion video will be required.
A statewide fiber optic network could provide a wide range of service levels to regents institutions and to other sites.
The institution has a current need for satellite downlink equipment and a campus wide distribution system for television programming. A satellite uplink system will be needed in two years.
Independent Study, a unit within the Division of Continuing Education, is mandated to provide correspondence study throughout the state. While primarily print oriented, courses are being offered through multi-media formats - print/computer, print/videotape, print/audiotape.
Data communications links are maintained between the Lawrence campus and the Regents Center. The need for these links will increase during the next several years. This will be particularly true when the new center is constructed.
It is expected that micros will be added at the rate of 300 to 500 for a 3 year planning horizon.

KUMC
The Medical Center has recently installed an integrated Library System. This system which is presently under test is connected to the ISN Data network which allows on and off campus access through the Data Communications Network or by dial up. The Wichita School of Medicine is directly connected via a permanent virtual circuit. This system should be fully operational in late summer or early fall. Regents instituions connected to the State ISN network may access this system through the network.
The Medical Center has applied to the FCC for low power television. Plans are underway to evaluate the viability of a PC based, Audio/Graphic/Video Imaging System to link off campus sites. The Boston University Medical Center uses this technology for consultation, long distance learning for cardiology, histology, radiology and pathology. KUMC has also evaluated requirements for compressed video applications to support education, administration and research.

PSU
Information Systems/Data plans to replace the Prime 9955 with a 32MB main memory, 2.884 GB Magnetic disk, 256 serial ports, ISO 802.3 standard network interface; replace the Prime 750 with two 6386 based 20 MHz microcomputers 8 MB main memory, 20 serial ports, StarGROUP network management software ISO 802.3 standard network interface, UNIX OS; add additional ISN capability including AIM cards and EBIM (Ethernet Bridging Interface Module) cards.
Computer Labs plans to expanded the number of units for all labs.
Planned data changes include an additional 4,000 feet of fiber optic with varying pair numbers.
Planned staff changes include 14 Full-time Information Systems personnel and 24 part-time student personnel.
FM Radio - KRPS is planning 2 channels of subcarrier transmission. The first will be used for visually handicapped programming. No plans at present for second subcarrier (possible distance learning application.)
Data Facilities plans include linking to the Kansas Regents Network (KARENET), through the use of a statewide agency located AT&T ISN equipment a data network for sharing of Regent and other data will be supported. Remote devices for connection to regional community colleges are planned.

Planned CCTV receive sites include 211 Rooms in 14 Buildings (29 Student Carrels)

WSU
The University has received an FCC license for the C-group of ITFS channels. The MRC proposes to use two of the four channels to extend WSU-13 programming to three cable head-ends which, in turn, will carry the signal to the towns of Derby, Mulvane, Haysville, Clearwater, Mount Hope, Colwich, Garden Plain, and Andale. The third ITFS channel will be used to broadcast NTU courses, teleconferences, and WSU-originated classes to businesses and schools within a 30-mile radius. Businesses

such as Boeing, Beech, KG&E, and the Kansas Bar Association have expressed interest in being receive sites. The fourth channel, which will initially represent excess capacity, will be leased to an MMDS operator.

The installation of the premise distribution system to support the AT&T telephone system will provide the infrastructure for expanding the campus data network to every building on the campus with minimum costs. The distribution system also will provie fiber optics media for data as well as video requirements in the future. Every campus building was provided at least six fibers with major buildings receiving twelve fibers during the installation of the distribution system. A major fiber distribution panel has been constructed in the Telecommunications Center to facilitate future applications requiring fiber optics media.

The University's synchronous network will be updated to provide SNA capabilities by the end of the calendar year 1989. This upgrade of both hardware and software will allow the University to bridge into the State of Kansas SNA Network for administrative applications. The ability for the University to access the Department of Administration's administrative data bases directly will become an important resource to WSU applications in purchasing, personnel, budgets, accounting, and electronic mail will be available, in the SNA environment, for any campus unit that is part of the campus network. This network will eliminate the KIPPS terminals currently used on campus to access Topeka applications and greatly improve our communications capabilities with the State.

ESU TELEVISION EQUIPMENT:

FUTURE SATELLITE DOWNLINK & CAMPUS DISTRIBUTION EQUIPMENT
1 Sony VO-7600 3/4" U-Matic Videocassette Recorder
1 Sony PVM-1220 Color Video Monitor
1 JVC BR-3500U Industrial VHS Videocassette Recorder
2 Sony PVM-8220 Color Monitors 9"
1 Leader Waveform Monitor
1 For.A FA-210 Digital Time Base Corrector
1 ComTech 3.8 Meter Satellite Antenna System
1 Standard Agile Satellite Receiver
1 Videocipher Television Descrambler
1 3M Routing Switcher
2 Video Modulators--Ch.4 and Ch.6

EXISTING VIDEO TRANSMISSION FACILITIES FOR CHANNEL 8 CABLEVISION
1 CVS 510 Digital Time Base Corrector
1 3M Routing Switcher
1 Shure SE30 Gated Compressor/Mixer
3 Sony 5600 3/4" U-Matic Videocassette Recorders
1 Jerrold Commandor IV Modulator ICC-T9
1 Sony CVM1250 Monitor
1 Beston CG-800 "Marquee"
1 Sony Trinitron Monitor
1 Heathkit Digital Weather Computer

EXISTING VIDEO PRODUCTION FACILITIES
1 3M Routing Switcher
1 For.A PVM-500 Production Video Switcher
2 Hitachi FP-1011B Color Cameras
1 Tektronix 520A NTSC Vectorscope
1 Tektronix 1480R Waveform Monitor
1 Tektronix 1410 Sync Generator
1 Tektronix 650A-1 Monitor
3 Tektronix 528 Waveform Monitors
2 For.A FA-200 Digital Time Base Correctors
1 Hitachi HV-1100A Color Camera
1 Convergence 195 Editor Controller
1 Convergence SW1-120 Switcher Interface
5 Sony PVM-1211 Color Video Monitors
1 Dukane Audio Mixer
3 Sony 5850 3/4" U-Matic Videocassette Recorder
1 Dukane Audio Mixer
3 Sony 5850 3/4" U-Matic Videocassette Recorder
1 Quantafont Q7A Teleproduction Graphic Titler
1 Laird Telemedia 5300 Optical Multiplexer with 16mm and Slide Projector
1 Schmer TCC-12/T 12-Pack Dimmer (Lights)
1 Sony RM-440 Automatic Editing Control Unit
1 Sony 2860A 3/4" U-Matic Videocassette Recorder
1 Sony CVM 1250 Monitor
1 JVC 310 Portable Color Camera
1 Sony 6800 Portable 3/4" U-Matic Videocassette Recorder
Misc. Studio Lighting, Grid, Curtains, Teleprompter, and Basic Props

EXISTING AUDIO PRODUCTION FACILITIES
2 Otari Reel-Reel Audio Tape Recorder
  Model MX5050 BQ II
  Model MX5050
1 Marantz PMD-200 Portable Cassette Tape Recorder
1 Tascam 133 Multi-Image Series Cassette Deck
1 Wollensak 2877 Stereo Visual Sync Cassette Recorder
1 Wollensak 2866AV Cassette Recorder/Dissolver
1 Dynafex DX-2 Noise Reduction System
1 Symetrix 522 Compressor/Limiter/Expander, Gate/Ducker
1 Tapco 6200B Audio Mixer (Stereo)
1 Realistic SA-1000 Stereo Amplifier
2 Realistic PA-25 Monitor Speaker
2 Sergeant 423 Monitor Speakers
1 Shure SR-107 Series 10-Band Equalizer
  Microphones:
    EV 644A Variable "D" Super-Cardoid
    EV RE-50 Omni-Directional
    EV RE-55 Omni-Directional
1 Telex 6120 Tape Duplication System
  Cassette and Open Reel Masters w/Three Cassette Slave Reproduce Units
1 Robins Heavy Duty Bulk Tape Eraser
1 Telex Audio Cassette Rewind Module
1 Technics SL-1700 MK2 Direct Drive Auto Turntable
1 Sony SB-300 Tapecorder Selector Router
1 Sync Tone Generator
1 Small Recording Room with Acoustical Wall and Ceiling Covering:
  Alpha 4' x 4' Panels (Anechoic Wedge Pattern)

FHSU TV EQUIPMENT:

Fort Hays State University Television Equipment is as follows:
2 Hitachi FP 1011-B Studio Cameras
1 Hitachi Z-31a Field Camera
1 Sharp XC-700 Field Camera
1 Vital Production Switcher
3 Gates/Harris Audio Boards
4 Sony VO-5600 VCRs
2 Sony BVU-950 SP VCRs
1 Sony VO-6800 Field VCR
1 Sony VO-4800 Field VCR
2 Sony 2860s
1 Panasonic 1/2" Editing System
2 CVS/Harris Time Base Correctors
1 VO-9800 SP VCR
8 1/2" JVC BR3500 HQ (duplication)
1 Datatek Routing Switcher
1 C/Ku 4.9 Meter Satellite Antennae
    Videocipher
1 C-Band 4.9 Meter Satellite Antennae
    Drake
1 Strand-Century Studio Lighting
2 Strand-Century Field Lighting
5 Tektronix Waveform Monitors
1 Tektronix Vector Scope

FHSU TV EQUIPMENT (CONT.)

1 Chyron VP-1 Character Generator
1 Amiga 2000 Computer Graphics System
Tektronix/Sony Monitors
Assorted Modulators and Various Support Equipment

KU TV EQUIPMENT:

The University of Kansas has no broadcasting television service.
Television production equipment includes the following:
2 Sony 3/4" Editing System - Cuts Only
1 Laird Character Generator
1 Waveform Monitor and Vectorscope
1 Time Base Corrector
1 Panisonic 1/2" VHS Editing System
1 Sony 8mm Editing System
3 Sony M3A Color Camera
3 Camera Remote Control Unit for M3A
5 Panisonic VHS Videotape Recorder
2 Sony 3/4" Videotape Recorder
1 Special Effects Generator
1 Film Chain with Sony M2 Camera
1 5 Meter Mobile C Band Satellite Downlink
1 3.7 Meter C/Ku Band Steerable Satellite Downlink
2 Sony M7 Camera
2 Wireless Microphone w/Transmiter & Receiver
1 Waveform Monitor/Vectorscope -Portable
1 Sync Generator
1 NTSC and RGB compatible Digital Slide to
Video Transfer Unit
2 Special Effects Generator
1 3/4" Portable Videotape Recorder
1 SMPTE Time Code Generator/Reader - Portable
1 SMPTE Time Code Generator/Reader - Rack
1 Cross Pulse Monitor w/Waveform Monitor

The above listed equipment does NOT include television camcorders, videotape recorders, and television receivers used primarily for classroom presentations.

The athletic department has 3/4" television equipment (dedicated - not available to others).
The Law School has 3 Sony DXC102 single chip cameras with remote control units.
Fiber optic main trunk cable throughout campus - no connections to campus buildings as of this report date.
University Relations office has 1 Sony M3A camera w/recorder.
Continuing Education has a ConferTech MB digital audio bridge unit.

Additional equipment will be ordered to establish a transmission link from Lawrence to Overland Park (site of proposed Regents Center) and to an existing transmission tower located at Bonner Springs.

KUMC TELEVISION EQUIPMENT:

The TV studio utilizes the following equipment:

Equipment	Amount	Model & Number	Date Acquired
Cameras	1	JVC #1900	January, 1982
	1	JVC #1900	January, 1983
	1	JVC #1900	January, 1986
	2	JVC #KY210	January, 1985
	1	Panasonic #3030	January, 1978
Video Switcher	1	JVC #KM 2000	January, 1985
Audio Mixer	1	Telemation	January, 1976
Character Generator	1	Quantafont Telepro, Q7A	January, 1981
Film Chain	1	Cohu	January, 1974
Routing Switchers	1	Dynair	June, 1973
Time Base Corrector with digital special effects	1	Chroma Digital Systems #766	January, 1985
Recorders	1	Sony #VO 5800	January, 1985
	1	Sony #VO 5800	January, 1986

PSU TELEVISION EQUIPMENT:

Pittsburg State University television equipment includes the following:

a. Television
   Two studio cameras JVC - KY-320
   Switch/Special Effects
   Character Generator
   Full frame timebase corrector
   U-Matic editor
   20 x 24 Routing Switcher
b. Satellite Capabilities
   Two C Band Antennas
     3.7 meter dedicated to F3 - The Learning Channel-CATV
     4.9 meter free to move to any synchronous satellite in view
   Block down converter system to three receivers
c. Standards/Protocols
   3/4" Production/Editing
   Standard-VHS Dubbing/Playback
d. Studio size
   20' X 21'
e. Portability
   Single camera EFP only (3/4, std.-VHS)

CATV Television Facilities

a. Equipment
   Two camera Studio
   Switcher/Special Effects
   Character Generator
b. Standards/Protocols
   3/4" Production
   Standard-VHS Production/Editing
c. Studio size
   14' X 28'
d. Portability
   Single camera EFP only

APPENDIX E:

VIDEO TAPE FORMATS, BROADCAST SYSTEMS

AND

ORGANIZATIONS WHICH SET STANDARDS

VIDEO TAPE FORMATS								
	ESU	FHSU	KCT	KSU	KU	KUMC	PSU	WSU
Quad-2"								
U-Matic-3/4"	x o	x o (SP)	x	x o	x o	x o	x o	x o
Beta-1/2"		x			x		x	
VHS-1/2"	x	x o	x	x o	x o	x	x	x o
Type C-1"				o				o
Betacam-1/2"								
M-1/2"								
8mm-.315"					x o			
M-II-1/2"								
Betacam Sp-1/2"				x o				o
S-VHS-1/2"			x	x o				
D1 Component								
D2 Composite								

x = playback capability for faculty/students
o = post production capability

BROADCAST SYSTEMS

NTSC: The National Television Standards Committee. Used in the U.S., in Japan, and in some other countries. It is a 525 line/60 field system.

PAL: Phase Alternation by Line. Used by England, West Germany, Holland and many other nations. It is a 625 line/50 field system.

SECAM: Sequential Couleur a Memoire. Used in France, the Soviet Union, parts of the Middle East and Eastern Europe. It is a 719 line/50 field system.

PROPOSED UPGRADES TO BROADCAST SYSTEMS

MUSE HIGH DEFINITION: Sony and Japan's NHK 1125 line/60 field system. It is a compromise of NTSC and PAL. The 1125 standard is midway between the line doubling of NTSC's 525 and PAL's 625. Originally touted as a universal standard, it has been rejected by the FCC as well as by members of the European community because its incompatability with current broadcast systems won't permit universal receivership.

SUPER NTSC: A trademarked name introduced by the Faroudja Laboratories in 1988 in an effort to modernize NTSC. Basically it line doubles the 525 standard. Its promise is to extend the life of NTSC until digital process systems come of age during the next few years.

EUREKA: Europe's system which answers compatibility problems. It delivers a 1250 line standard, double that of PAL.

ORGANIZATIONS WHICH SET STANDARDS

ANSI: American National Standards Institute.

ATSC: Advanced Television Systems Committee.

EIA: Electronic Industries Association

SMPTE: Society of Motion Picture and Television Engineers.

WORLD BROADCASTING SYSTEMS

COUNTRY	LINES/FIELDS	COLOR	VOLTAGE (V)	(Hz)
Afghanistan	625/50	PAL	220	50
Albania	625/50	SECAM	220	50
Algeria	625/50	PAL	127-220	50
Andorra	625/50		220	50
Angola	625/50		220	50
Argentina	625/50	PAL N	220	50
Australia	625/50	PAL	240	50
Austria	625/50	PAL	220	50
Azores	625/50	PAL	220	50
Bahamas	525/60	NTSC	120	60
Bahrain	625/50	PAL	220	50
Bangladesh	625/50	PAL		
Barbados	525/60	NTSC	120	50
Belgium	625/50	PAL	127-220	50
Bermuda	525/60	NTSC	120	60
Bolivia	525/60	NTSC	115-230	50
Brazil	525/60	PAL M	220	60
Bulgaria	625/50	SECAM	220	50
Burundi	625/50		220	50
Cameroon	625/50		127-220	50
Canada	525/60	NTSC	110-240	60
Canary Is.	625/50	PAL	127	50
Central African Rep.	625/50		220	50
Ceylon	625/50		230	50
Chad	625/50		220	50
Chile	525/60	NTSC	220	50
China (Peoples Rep.)	625/50	PAL	220	50
Colombia	525/60	NTSC	110-220	60
Congo (Peoples Rep.)	625/50	SECAM	220	50
Costa Rica	525/60	NTSC	110	60
Cuba	525/60	NTSC	120	60
Curacao	525/60	NTSC	120	60
Cyprus	625/50	PAL	220	50
Czechoslovakia	625/50	SECAM	220	50
Dahomey	625/50		220	50
Denmark	625/50	PAL	220	50
Dominican Rep.	525/60	NTSC	110	60
Ecuador	525/60	NTSC	120	60
Egypt	625/50	SECAM	220	50
El Salvador	525/60	NTSC	110	60
Ethiopia	625/50		127	50
Fiji	625/50		240	50
Finland	625/50	PAL	220	50
France	625/50	SECAM	115-230	50
Gabon	625/50	SECAM	127-220	50
Gambia	625/50			
Germany (Dem. Rep.)	625/50	SECAM	220	50
Germany (Fed. Rep.)	625/50	PAL	220	50
Ghana	625/50		230	50
Gibraltar	625/50	PAL	230	50
Great Britain	625/50	PAL	127-220	50
Greece	625/50	SECAM	110-220	50
Greenland	525/60		220	50
Guam	525/60	NTSC	110	60
Guatemala	525/60	NTSC	110-220	60
Guinea	625/50		127-220	50
Guyana	625/50	SECAM	127	50
Haiti	625/50	SECAM	115-220	50
Hawaii	525/60	NTSC	117	60
Honduras	525/60	NTSC	110-220	60
Hong Kong	625/50	PAL	220	50
Hungary	625/50	SECAM	220	50
Iceland	625/50	PAL	220	50
India	625/50	PAL	230	50
Indonesia	625/50	PAL	220	50
Iran	525/50	SECAM	220	50
Iraq	625/50	SECAM	220	50
Ireland	625/50	PAL	220	50
Israel	625/50	PAL	230	50
Italy	625/50	PAL	127-220	50
Ivory Coast	625/50	SECAM	220	50
Jamaica	625/50	PAL	110	50, 60
Japan	525/60	NTSC	100-200	50, 60
Jordan	625/50	PAL	220	50
Kenya	625/50	PAL	240	50
Korea (North)	625/50			
Korea (South)	525/60	NTSC	100	60
Kuwait	625/50	PAL	240	50
Lebanon	625/50	SECAM	110-190	50
Liberia	625/50	PAL	120	60
Libya	625/50	SECAM	120	50
Luxembourg	625/50	SECAM	120-208	50
Malagasy Rep.	625/50		127-220	50
Malawi	625/50		220	50
Malaysia	625/50	PAL	240	50
Mali	625/50		125	50
Malta	625/50		240	50
Martinique	625/50	SECAM	125	50
Mauritania	625/50		220	50
Mauritius	625/50	SECAM	220	50
Mexico	525/60	NTSC	127-220	50, 60
Monaco	625/50	SECAM	125	50
Mongolia	625/50			
Morocco	625/50	SECAM	115	50
Mozambique	625/50	PAL	220	50
Netherlands	625/50	PAL	220	50
Netherlands Antilles	525/60	NTSC	120-220	50, 60
New Caledonia	625/50	SECAM	220	50
New Zealand	625/50	PAL	230	50
Nicaragua	525/60	NTSC	117	60
Niger (Rep.)	625/50		220	50
Nigeria	625/50	PAL	220	50
Norway	625/50	PAL	230	50
Oman	625/50	PAL	230	50
Pakistan	625/50	PAL	220	50
Panama	525/60	NTSC	110	60
Paraguay	625/50	PAL	220	50
Peru	525/60	NTSC	220	60
Philippines	525/60	NTSC	115	60
Poland	625/50	SECAM	220	50
Portugal	625/50	PAL	110-220	50
Puerto Rico	525/60	NTSC	120	60
Rhodesia	625/50	PAL	220	50
Rumania	625/50	SECAM	220	50
Rwanda	625/50		220	50
Samoa	525/60	NTSC	120	60
Saudi Arabia	625/50	SECAM	120-230	50, 60
Senegal	625/50	SECAM	125	50
Sierra Leone	625/50	PAL	230	50
Singapore	625/50	PAL	220	50
Somalia (Rep. of)	625/50		220	50
South Africa	625/50	PAL	220	50
Spain	625/50	PAL	127-220	50
Spanish Sahara	625/50			
St. Kitts	525/60	NTSC	220	60
Sudan	625/50	PAL	220	50
Surinam	525/60	NTSC	115-127	50, 60
Swaziland	625/50	PAL		
Sweden	625/50	PAL	220	50
Switzerland	625/50	PAL	220	50
Syria	625/50	SECAM	115-220	50
Tahiti	625/50	SECAM		
Taiwan	525/60	NTSC	100	60
Tanzania	625/50	PAL	230	50
Thailand	625/50	PAL	220	50
Togolese Rep.	625/50		127-220	50
Trinidad & Tobago	525/60	NTSC	117	60
Tunisia	625/50	SECAM	117-220	50
Turkey	625/50	PAL	110-220	50
Uganda	625/50	PAL	220	50
Upper Volta	625/50		220	50
Uruguay	625/50	PAL	220	50
U.S.A.	525/60	NTSC	110	60
U.S.S.R.	625/50	SECAM	220	50
Venezuela	525/60	NTSC	110-220	60
Vietnam	525/60		120	50
Virgin Is.	525/60	NTSC	115	60
Yemen	625/50		220	50
Yugoslavia	625/50	PAL	220	50
Zaire	625/50	SECAM		
Zambia	625/50		230	50

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APPENDIX F:

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